AUGUST

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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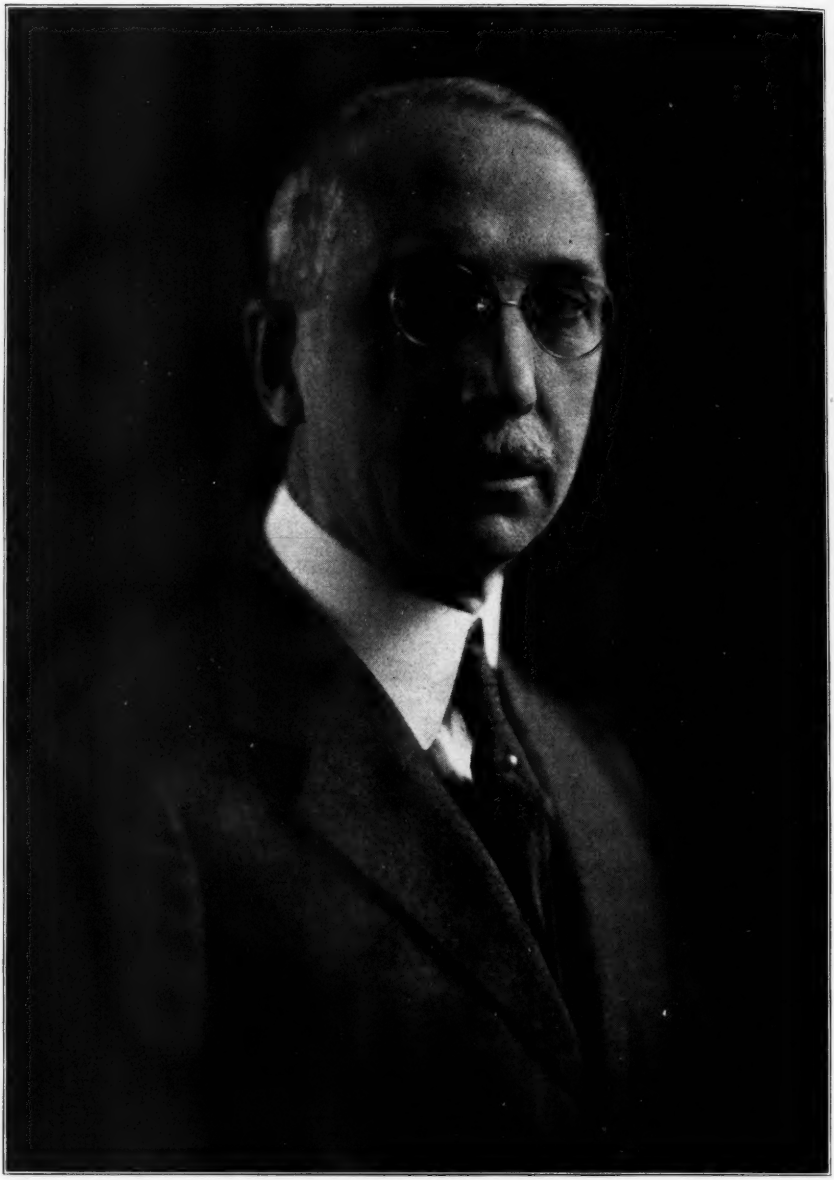

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President of the Seventh International Dental Congress

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Original Communications

A DENTAL EDUCATIONAL PROGRAM*

By SHEPPARD W. FOSTER, D.D.S., F.A.C.D., Atlanta, Georgia

YOU have asked me to discuss, tonight, the subject, "A Dental Educational Program." I am of the opinion that it will probably be more appropriate at this hour to address ourselves to the subject of the manifold number of dental educational programs already presented and seriously ask what will be our final port of destiny if the present state of agitation continues.

I have been greatly interested in this presentation of a health program by the president of the American Medical Association. The close alliance of dentistry in all of its activities with such a program must necessarily lead to the question of preparedness. Again, the ability of the dental profession to measure up to its full responsibility in the discharge of its duty as an independent branch of health service is almost wholly dependent on our dental educational program.

There probably has been no subject which for the past several years has so engaged the attention of the dental profession as has that of dental education, and no subject on which such a diversity of opinion exists. There is no question that a spirit of unrest and apprehension regarding our educational program has crept into the minds of the profession.

Permit me just here to say that I am an optimist. I am proud of the fact that I am a dentist. I am truly proud of dentistry, its past achievements and

*Read at a joint meeting of the Chicago Medical and the Chicago Dental Society, Jan. 24, 1926.

its present high attainment, and I have a feeling of confidence in its future.

An exhaustive survey of the dental institutions of the United States and of Canada was made in 1920 and 1921 by Dr. William J. Gies, under the direction of the Carnegie Foundation, assisted by the Dental Educational Council of America. This survey was of great value to the Council and has been a splendid contribution to dental education. The inspection was heartily acquiesced in by the various colleges. There was a hope then that dentistry would be endowed and that dental colleges would receive such financial support as has been given to medical educational institutions. The publicity coincident with this survey, as a natural consequence directed the attention of the profession toward dental education, and not a few of our most altruistic and sincere teachers of dentistry, as well as others of our profession, have become panic stricken because they have become imbued with the idea that, if universal and radical changes are not made in our educational program, dentistry is to be junked, and the honorable and ancient profession of medicine will step in and establish a specialty of stomatology, or some other special "ology," and will assume all responsibility for the treatment of the oral cavity. These impressions evidently have been strengthened by significant discoveries and truths revealed principally by those members of the dental profession who have been engaged in research work during the past decade, coupled with the observations of such a potential investigator as Dr. Gies, whose word has been quoted on numerous occasions after this survey, to wit:

> General realization during recent years that dentistry has become equal in importance in health service to a specialty of medicine has brought dentistry face to face with a dilemma. Dentistry will grow in its own field to be as competent as a specialty of medicine to render health service, or it will not. The choice is entirely within the present option of dentistry. If dentistry will not or cannot grow into the efficiency of the equivalent of an oral specialty of medicine, and if in that event medicine, responsive to public needs, should create a specialty of stomatology, then dentistry obviously and of necessity would be restricted to the performance of the function of technical assistant to that specialty of medicine. The development of the art of dentistry into the equivalent of an oral specialty of medicine would require a more comprehensive definition of dentistry, corresponding extension of the scope of dental health service and commensurate improvement of dental education.

I quote the following from a recent editorial in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION:[1] "Nearly every leading man who is in any way connected with dental education, as well as some who are not connected with it, seems imbued with his own particular plan, which, by the way, is in the main different from the plans of others. This is leading to much confusion, and the rank and file of the profession are at sea; they do not know what to expect."

There have been numerous plans actually proposed; one, advocating a continuation of the plan of a four-year course of study in a dental college, after graduation from an accredited high school; another, one year of university study,

1. Confusion in Dental Education, J.A.D.A., 12: 1006 (Aug.) 1925.

followed by a dental course consisting of three years of forty-four weeks, each year divided into four quarters of eleven weeks; another, one year of predental training in a university or college, with four years of dental college work; another, one year of predental work, and four years of dental college work, all five years to be spent in dental college. Again, there is recommended what is termed the two-three-graduate plan; that is, two years of university and three years of dental college work; and again, two years' work in a university and four years in a dental college. A course consisting of five years, with a second year of university work dovetailing into the first year of the dental college course leading to the degrees of both B.S. and D.D.S. is suggested; and still another, which contemplates courses of instruction leading to various degrees, placed on what might be termed a sliding scale in which dental services may be subdivided or specialized in. This plan would provide (1) a two-year course, to be designated as a dental assistant's course; (2) a dental hygienist's course; (3) a dental technicians' course; (4) dental radiographers' course, and (5) a course for dentists, with the degree of bachelor of science. The foregoing all contemplate admission to the dental college after completion of four years of high school work.

These various degrees or certificates require courses of dental college instruction ranging from two to four years, and each has a certain prescribed field of service. Further, dentists who take one year of postgraduate work are to receive the degree of master of science, and lastly there is a course culminating in a D.M.D. degree, signifying proficiency in one of the several dental specialties, such as dental surgery or orthodontia. Admission to candidacy for the D.M.D. degree would include two years of collegiate work, four years of dental college, and one year of internship in a hospital or a year of research work, making a total of seven years.

With all of these plans being presented, is there any surprise that there is confusion and apprehension as to what may be the ultimate outcome?

I have scarcely the courage or the desire to suggest a plan, but I have faith in the good, conservative judgment of those who have the shaping of our educational destiny, and I predict that out of this seeming chaos will be evolved a sane system—one that will meet every requirement and measure up in service value to the so-called oral specialty of medicine, and yet retain that manual skill so necessary for efficient service in dentistry.

Rejected by the honorable medical profession, and its principal exponents representatives of the barbers' trade, dentistry came into existence as an independent profession. It required indomitable courage on the part of those pioneers who, in 1840, crystallized the idea and established the first dental college, thus proclaiming to the world that dentistry was of such value to mankind as to entitle it to rightful recognition as an independent specialty of medicine.

Dentistry has met every emergency; has discharged every obligation; has advanced its educational program at all times sufficiently rapidly to meet the

demands of society, general conditions and geographic environments.

The first medical college in America was established 160 years ago. The first dental college of the *world* was established only eighty-six years ago. It was not until 1910 that the American Medical Association, through its council on medical education, advanced to a high school prerequisite for the study of medicine; then to one year of premedical work in 1914, and only about eight years ago, to two years of university or premedical work for entrance to the medical college.

Dentistry, as an independent profession, has now officially advanced to one year of predental college work. When we make these comparisons, I see nothing in the way of dental education which need create a calamity howl or necessitate at every turn a self-appointed Moses who must present an educational plan of his own creation with which he may hope to lead dentistry out of this so-called dilemma and save it from an utter debacle.

I hope that I may not be misunderstood. We all know that dental education must continue in its onward march. Not only dentistry, but every phase of education, if directed in the interest of best service to mankind, should constantly advance, but must conform to a rational, orderly improvement. No standard may be advanced too rapidly.

May I ask what the greatest potential factor in the advancement of dentistry to its present state of efficiency has been? Most assuredly our system of dental education.

When I look back over the past forty years and recall the names of such men as C. N. Pearce, Jonathan Taft, James Truman, Frank Abbott, G. V. Black, M. C. Marshall, Wilbur Litch, R. B. Winder, W. C. Barrett, William H. Morgan and others sacred to our memory, whose lives were a contribution to dental education, I feel that the example of these men alone is sufficient guarantee to the world that dental education in the future, if weighed in the balance, will not be found wanting.

May we again inquire what was the principal medium through which the world was made aware of the fact that dentistry has become equal in health service to a specialty of medicine? It was by presentation of irrefutable truths, revealed principally as the result of research investigations by members of the dental profession. Then why this charge that dentistry, in the face of this announcement, finds itself in a dilemma?

If dentistry, under its present system of education, has been able to discover certain truths, then dentistry should, most assuredly, and without becoming panic striken, be able to present an educational curriculum to meet present conditions.

We must not lose sight of the fact that in dental education there are several things to consider. First in importance is a reasonably cultured and trained scientific mind. Secondly, technical skill is imperative; and thirdly, but of equal significance, there is the factor of supply and demand. The ability of dentistry to furnish a sufficient number of graduates to supply service to the constantly increasing demands of the public must be considered. Finally,

conservation of time should not be lost sight of in our educational program.

American business and industry, because of the application of practical business methods, the elimination of so-called red tape, has become noticeably conspicuous for its progressiveness throughout the world. The same principles should not wantonly be lost sight of in our educational scheme.

Biologic investigations which have revealed the close interrelation of oral infection and general disease evidently have caused some of our most altruistic men in dentistry to lose sight of the importance of mechanics and to rely almost wholly on training in biology. Because of such an unbalanced course of instruction, I cannot favor the two-three-graduate plan.

I cannot advocate the two-four year plan; first, for economic reasons. We must know that on account of the complete requisites for efficient dental service, the years of maximum usefulness are less in dentistry than in any of the learned professions. It means too great a handicap when six years of the most vital activity are taken out of a man's life, to say nothing of the financial strain. Again, if we fail to reckon with the factor of supply and demand, we may find ourselves in a serious dilemma.

It has been only since 1918 that medical education advanced to two years of university work, yet there can be no disguising the fact that a decided reaction is taking place and there is a strong feeling that medical education has advanced too rapidly and that possibly it should retract in order to best serve humanity.

Medical and dental education are analogous. I do not know what the opinion of the president of the American Medical Association may be at this time, but no doubt many of you are familiar with the words of Dr. William Allen Pusey in his annual address as president of that body in 1924. Among other things on which he had the courage to express his convictions, he was bold to make the statement that "a four year high school course, which included two years of Latin, four years of English, one year each of chemistry, physics and biology, and three years of mathematics, plus a year or two of history, is sufficient preparation for the study of medicine."

Dr. Palmer Findley, president of the Nebraska Medical Association in 1925, in a discussion of the subject of medical education and the family doctor, said: "The demands of modern medical education are excessive for the needs of the general practitioner and should be lessened and made more practical." Dr. Findley sent out a questionnaire that he might ascertain the views of the profession on the status of medical education. He received numerous replies. Among the typical ones received were two that I will quote. 1. "Make a doctor—not a scientist." 2. "Cut out the unnecessary things that are not used in the practice of medicine and quit trying to make specialists out of every student."

Unquestionably there is a growing tendency on the part of some to inject into our dental curriculums special studies at the expense of the important fundamental subjects.

I am not alone in my opinion that advanced modern medical and dental education are driving men into ultra

specialization. I have naught to say against the efficiency of the specialist, but, to my mind, one of the saddest results is that it has caused the passing of the grand old family doctor. As for me, I regret that that day seems forever gone when we came under the Christian influences of his kindly nature and felt the tender touch of his cool hand upon our fevered brow as we listened to the comforting and sympathetic words of that most beloved and saintly character—the family physician. It seems that the family dentist is fast following in his wake.

No less authority than Dr. Simon Flexner is quoted as saying: "Medical curricula the world over contain too many subjects as well as too much material. The burden would be heavy enough, if it were confined to the larger original units; but within the last fifty years one specialty after another has been split off, erected into a professionship, made a subject of special teaching, and finally won a place on the examination list. Men become educated by steeping themselves thoroughly in a few subjects, not by nibbling at many."

We must not establish a curriculum that will have a tendency to make an autocracy of our profession. This will inevitably result if our standard is beyond the reach of the average American youth.

So I cannot endorse the plan that provides for the seven different courses covering all degrees from dental assistant to the seven year course leading to the doctor's degree. My chief objection to this plan is that dentistry, as a profession, is robbed of its dignified identity, is lost in the maze of so-called "terminals" and degrees, and does not conform to established state laws.

I think that the time has arrived in our educational program when we should leave the high school and advance to one year of college work for admission to the professional course.

From the standpoint of American business efficiency and economics, there is food for thought in the proposed one year in a university, with three years in a dental college of forty-four weeks each. This would give more weeks of instruction in three years than are given at present in four years. Why need adult students be so profligate with time spent in vacations? If financially pressed, they may drop out for three or six months, instead of for an entire year, as is so often the case now. This would, at the same time, provide teachers with sufficient vacations each year for recreation or study. In a word, such a program embraces all that is embodied in the four year college course following one year of university work, and conserves one year of time. The principle may be applied to any of the curriculums mentioned.

The proposed plan of offering both the degree of B.S. and that of D.D.S. in five years by interlocking the university with the dental course no doubt has merit, but it seems to me that the schedule as presented is impractical, inasmuch as several seminar subjects are proposed without sufficient allotment of time.

I believe the most desirable plan proposed, and the one I heartily endorse, is that of the Dental Educational Council of America. This contem-

plates one year of university work, followed by four years, of eight months each, of dental college work. The Educational Council has been more deliberate and has devoted more thought and time to this question from all angles than have other groups; and the council has concluded that the public can best be served and at the same time the educational interests be sufficiently advanced to meet all requirements by the adoption of a five year course, one of which must be predental. In this predental year, such subjects as English, inorganic chemistry, biology and physics are disposed of. Therefore, the hours previously devoted to these subjects could be utilized in the dental college curriculum by adding to the subject of pathology, bacteriology and physical diagnosis, together with augmented laboratory and clinical courses, which should include a careful study of the relation of dental infection to general health and disease. Colleges all recognize the marvelous advances made in science and research, and we may be sure they will not be slow to adjust their curriculums to conform to these advances. I believe that this plan offered by the Dental Educational Council of America would meet with greater favor than any of the other programs. As previously stated, geographic environment and regional needs must be duly considered. States west of the Rocky Mountains, recognizing their own responsibilities as others cannot, are finding it probably unwise at this time to advance beyond four years of college work after graduation from an accredited high school.

Notwithstanding the fact that, in my opinion, the plan proposed by the Educational Council is the most satisfactory, we cannot forecast which finally will be adopted. I have absolute confidence that conservative American judgment will prevail.

Dentistry shall continue to fulfil its obligations as in the past and it will cooperate with, but not become subjugated to, medicine as one of its specialties, dependent on it for existence, as has been inferred, but will live on as an honorable, independent profession.

IMMEDIATE CLOSURE OF WOUNDS ABOUT MOUTH AND JAWS*

By GUY R. HARRISON, D.D.S., Richmond, Virginia

NOT being satisfied with the result obtained by the usual gauze packing and other accepted methods in treatment of operative wounds about the jaws, especially those wounds left after extirpation of large cystic growths, I began a search, some years ago, for a means of more satisfactory care. During these investigations, use was made of gauze, bone plombe, fat transplants, various bismuth pastes and the Partsch method. The last named has the same objectionable feature as the gauze packing method in that there is a depression left, about the size of the mass that was removed. The depression in some instances is quite deforming and is a source of annoyance to the patient because food will inevitably collect in it, making more difficult the construction of satisfactory prosthetic apparatus. Not only does surgery have for its goal the elimination of disease and the readjustment of perverted function; it also includes the correction of deformity; so, in operative procedures, especially about the face and mouth, it should always be realized that every effort consistent with sound surgical judgment should be made to leave the structures operated on as free as possible from deformity and interference with function.

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Sixty-Seventh Annual Session of the American Dental Association, Sept. 23, 1925.

The substance of this paper represents the results of quite an extensive experience in the use of the method advocated, which in hundreds of cases has given such satisfactory results. I hope I will not be understood as meaning that the method cannot be improved. I believe that it rests upon sound surgical principles and has served to improve methods of caring for wounds about the jaws, especially those left after extirpation of nonmalignant tumors, cysts, nonerupted teeth, etc. It is realized that a surgeon may place too great confidence in a favorite method of treatment; but it can readily be seen that one who does much surgery about the mouth will continue to meet cases that will cause much anxiety, and as regards which, when dismissed from treatment, he may have grave doubts as to whether handled in the best possible manner.

DEFINITION AND ADVANTAGES

It may be well to define "immediate closure" as here used. The word "immediate" is relative. It does not imply immediate tight suturing of mouth wounds as is done in the wall of the abdomen in nondrainage cases or in closing a neck wound after a carotid ligation, but refers to the obliteration at the primary operation of the defect left after removal of abnormal tissues about the jaws by plastic procedures, using adjacent and nearby utilizable tissue by dissecting a flap or flaps, or by

drawing tissue into the defect, and thus lessening deformity and minimizing or preventing interference with form and function.

By this method, we are enabled to lessen considerably the postoperative discomfort and shorten alike the time of healing of the wound and the period of observation of the case. To give a proper background and basic reasons for my belief in the value and practicability of immediate closure of such wounds, it is necessary to state several well-recognized principles of plastic surgery. It should be remembered that the principles governing the successful practice of surgery, regardless of the field, are the same; but the application of these principles vary in different fields; for example, the large blood supply about the jaws permits successful plastic surgery, which, if attempted elsewhere, would be doomed to failure. Among the requisites for a successful plastic operation are: a sufficient amount of utilizable tissue containing a good blood supply; not too great tension on flaps or suture lines; raw surface in contact with raw surface; exposed raw surface covered with epithelium, and a minimum amount of suture material, which should be as small as practical. Furthermore, spaces in which there is no tissue as well as large blood clots, must be avoided and provisions made for control of edema and escape of normal wound secretions. There should be as little interference with the healing wound as possible. Analysis of the method will show that it can be made to conform to the stated requisites.

TECHNIC

Success with the method advocated rests upon meticulous care in technic, study of the needs and possibilities of each case, and, above all, the exercise of sound surgical judgment. In discussing plastic surgery in general, Davis[1] says: "Too much emphasis cannot be laid on the cultivation of sound surgical judgment, and on the importance of careful examination and study of the various possibilities and procedures which may be beneficial in each individual case, as it is seldom we find two cases exactly alike in plastic surgery." It is believed that the technic can best be described by discussion of cases. Figure 1 illustrates a case of cystic growth in the maxilla extending from the midline to the second bicuspid area inclusive. As all the teeth involved had living pulps, except the lateral incisor, the pulp of which did not die until months after the patient knew of the presence of the growth, it is believed that this was a case of mucous cyst of nasal origin, following surgery on the nasal septum. Incision was made in the vestibule of the mouth, extending from the midline to the first molar, on a line about three-quarters inch above the gingival border, down to the thin wall of bone covering the cyst, followed by a subperiosteal elevation of soft tissues. The bony wall was then removed and the cyst wall elevated in the region of the tooth roots. The roots of the incisors, cuspids and bicuspids were found to be exposed. These teeth were then carefully removed. Further dissection showed the cyst wall to be continuous with the mucous membranes of the nasal cavity and maxillary antrum, there being no bony partition at any point between the cyst and the structures named. After removal of cyst walls, there was an

1. Davis, J. S.: General Plastic Surgery, Ann. Surg., 77: 257 (March) 1923.

opening from the mouth to the nasal cavity and to the mucous membrane of the maxillary antrum. An immediate closure of the wound was made by dissecting a flap of muscle, beginning at about the infraorbital foramen, wide enough to fill the defect, with its base downward at about the level of the primary incision. An opening was made in the deepest portion of the defect, through the bone into the roof of the mouth. The muscle flap was caught with several mattress sutures of plain catgut, which were brought through the opening to the roof of the mouth and, after the needle had taken a good bite into the muscle, carried back through the opening to the roof of the mouth. The sutures were left long, and tension was made on them to see how the muscle flap would be adapted to the defect. The flap was then lifted out of the defect and another opening was made from the wound cavity to the roof of the mouth near the opening through which the catgut sutures passed. The catgut sutures were each then passed through opposite holes in a small pearl shirt button; tension was made on them, and they were tied over the button. The mucous membrane was carefully freed from the flap, beginning at the superior lip of the primary incision, and sutured with very fine plain catgut to the inferior lip. A freshly annealed 26 gage silver wire was then passed on a straight Hagedorn needle from the skin surface though the flap in the defect to the roof of the mouth through the second opening

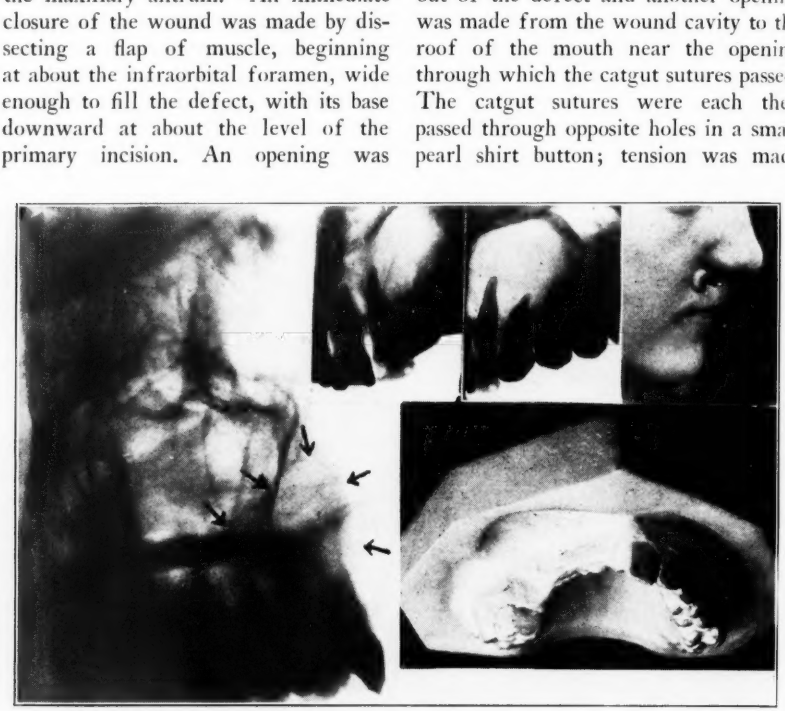

Fig. 1.—Left and above, center: Lateral and intraoral radiograms of cystic growth of maxilla, extending from the central incisor to the second bicuspid area inclusive. Right, above: Appearance of tension suture on the face. Below: Cast made from the impression of the mouth, showing the outline of the flap used to obliterate the defect that was present after removal of the cyst.

made in the bone. The end of the wire in the mouth was next made fast through the eyes of a button about a half inch in size. Another button was placed on the other end of the wire, and followed by four perforated shot, desired tension being made by pushing the shot and button down on the wire and crushing the topmost shot. The wire was then cut off and turned down in order to make sure that it would not slip. It is considered essential to avoid the mucous membrane's being carried into the defect, to prevent the possible development of a mucocele. In one of my cases, a mucocele developed. More than one shot was placed on the wire to permit change in tension if desired. Compresses wrung out of ice water were kept on the face constantly for forty-eight hours. No care was given the wound other than the frequent irrigation of the mouth with potassium permanganate solution one-eighth of 1 per cent. The catgut sutures were absorbed in five days, and the silver wire suture was removed on the eighth day. Figure 1 shows a lateral roentgen-ray plate and intra-oral films of case, together with photographs of a button on the face and a cast made from the impression of the mouth taken three months after operation. The cast shows the outline of the flap running into the space where the defect was situated after extirpation of the cyst. Figure 2 shows a cyst of the maxilla arising from a pulpless tooth. The same technic was used as in Figure 1, with slight modifications to meet the conditions found. Figure 3 is from the same case. *A* and *B* are photographs of the patient a few months

Fig. 2.—A cyst of the maxilla arising from a pulpless tooth. Arrows outline the cyst from the lateral view.

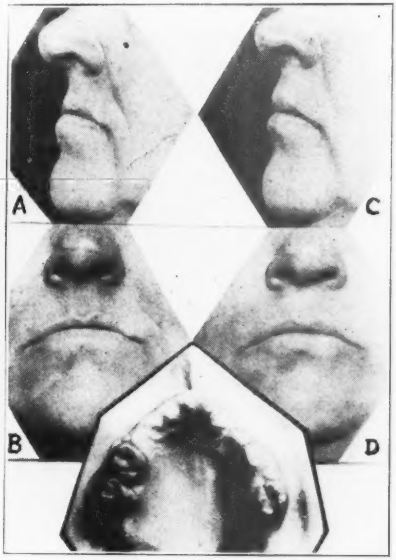

Fig. 3.—Case shown in Figure 2, *A* and *B*, appearance of patient a few months after operation; *C* and *D*, appearance after prosthesis. Below: Cast made from the impression of the mouth taken at the time the photographs *A*, *B*, *C* and *D* were made.

after operation, *C* and *D* are photographs of the patient after prosthesis. A photograph of the cast made from the impression of the mouth is included. Figure 4 shows a cast of a case of cyst

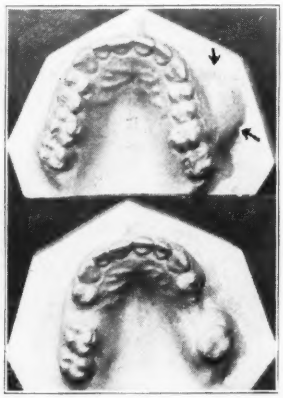

Fig. 4.—Cast of a cyst of the maxilla caused from a pulpless first molar. Above: Before operation; below: after operation. Nearby tissue was used to fill in the defect.

Fig. 5.—Casts made before and after operation in a case of cylindroma. After the growth was removed, the wound opened into the maxillary antrum and nasal fossa. Flaps from the cheek were used to close these openings.

of the maxilla caused from a pulpless first molar, before and after operation. In this case, no flap was used. Mattress sutures were passed through the bone to the roof of the mouth and tied over a button. No tension sutures were used. Pulpless teeth involved were removed. No bony partition existed between the cyst and the maxillary antrum. Figure 5 shows casts before and after operation in a case of cylindroma. The hard palate and maxilla in the vicinity were destroyed by the growth. After the removal of the tumor, the wound opened into the nasal fossa and maxillary antrum. Flaps from the cheek were used to shut off the nasal fossa and maxillary antrum from the mouth. The flaps were carried into the defect and sutured to the mucoperiosteum of the roof of the mouth on the opposite

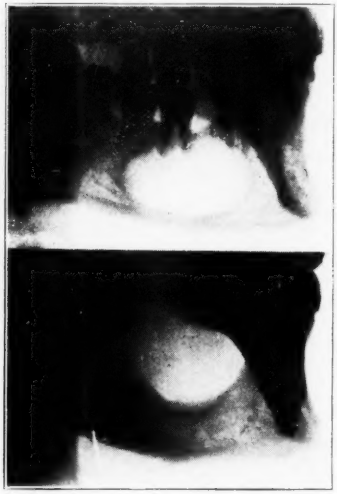

Fig. 6.—Cyst of the mandible arising from a pulpless tooth; before and after operation. The defect left in the bone after the cyst was removed was obliterated by drawing muscle tissue from the cheek into it.

side. To help cover the large raw surface with epithelium, the anterior pillar of the tonsil was turned up, split and

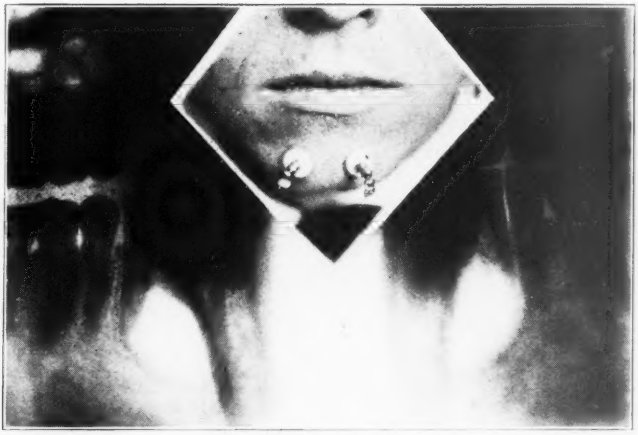

Fig. 7.—Appearance of right and left sides of the mandible in a case of cyst arising from a pulpless mandibular incisor; showing destruction of most of the bone about the symphysis except the cortical portion along the inferior border. Insert: Technic for drawing muscle tissue into bony defect by the use of a tension suture of silver wire.

sutured over the area. Sutures for the relief of tension on the approximating sutures were carried through the alveolar bone between the root ends of the teeth on the left side to the buccal sulcus and tied over a button. I would not now do this but would make a casting covering the crowns of the molar and bicuspids, to which, by extensions, there would be attached a bar running along the hard palate paralleled with the occlusal surfaces of the teeth but high up in the roof of the mouth. Tension sutures would be attached to this bar. A similar method is often indicated where immediate closure of the operative wounds in the mandible is made, as often the lingual wall of bone is very thin and the tissues over the lingual side of the mandible do not stand the pressure of the buttons so well.

Figure 6 shows a cyst of the mandible

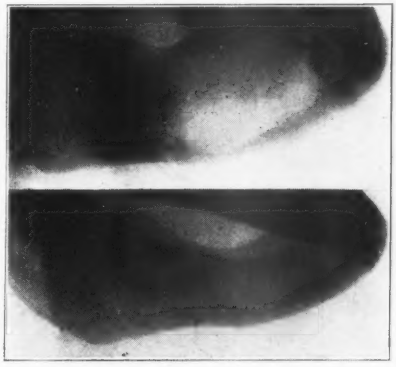

Fig. 8.—Cyst of the body of the mandible (above) before operation and (below) three months after operation, showing the amount of bone that has been regenerated. Muscle from the cheek was drawn into the defect in the bone produced by the cyst, but tension sutures through to skin were not used.

arising from a pulpless tooth, before and three months after operation. Cases in the mandible do not often require flaps, as the muscle tissue of the cheek or chin can nearly always be drawn into the defect, after the buccal wall of bone is

Fig. 9.—A typical example of a case in which the roots of the involved tooth should be separated and removed and approach to the cyst should be made by an incision in the vestibule of the mouth, well down toward the inferior border of the mandible, and the bone above the cyst left intact.

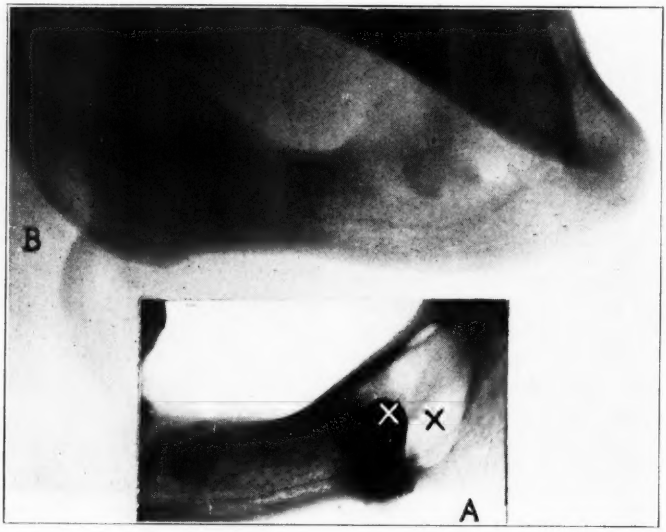

Fig. 10.—An odontocele. *A*, intraoral radiogram before operation; *B*, extraoral radiogram after operation, showing amount of bone that has regenerated. The root end of the tooth projected beneath the inferior border of the mandible.

cut away, by the use of mattress sutures, passed through the lingual wall of the bone and tied over buttons. Neither are tension sutures from the skin surface often necessary. (Figs 6, 7, 8 and 9.) In cases like that shown in

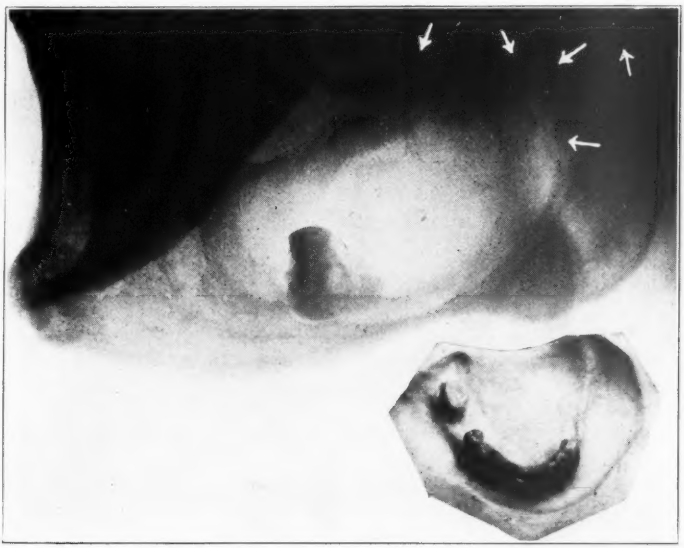

Fig. 11.—Case of an odontocele and adamantinoma. The arrows point to some of the many cystic cavities in which the cells resembling the columnar cells of the enamel organ were found. The results obtained from an esthetic and functional standpoint are shown in the cast (below, right).

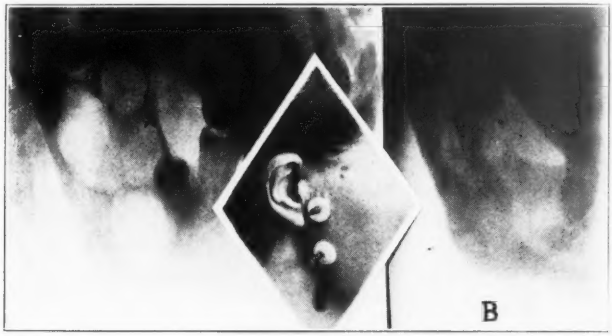

Fig. 12.—A multilocular cystic odontome that had destroyed nearly all the medullary bone of the ramus of the mandible. The insert shows the silver wire tension suture fastened on the face and the strip of rubber dam used as a drain.

Figure 9, the roots of the involved tooth should be separated and removed and approach to the cyst should be made by an incision in the vestibule of the mouth, well down toward the inferior border of the mandible, and the bone above the cyst left intact.

Figure 10 shows a case of epithelial odontome (odontocele); *A*, an intra-oral plate before operation, and *B*, an extra-oral plate after operation. The root end of the tooth projected beneath the inferior border of the mandible. As the lingual wall of the bone was so thin in this case, a U-shaped incision, beginning and ending on the lingual side of the bone and extending well over to the buccal side and up into the cheek, was made. This provided the flap to place in the defect left after the lingual wall, tooth and cyst were removed. Sutures were passed through the flap and carried through the buccal wall of bone at points indicated by *X*, and tied. No buttons or tension sutures were used.

Figure 11 shows an odontocele and adamantinoma of the mandible. The cells resembling the columnar cells of the enamel organ were found in the numerous cystic cavities, some of which are pointed out with arrows. The result obtained after immediate closure of the operative wounds by the method under discussion is shown in the photograph of the cast.

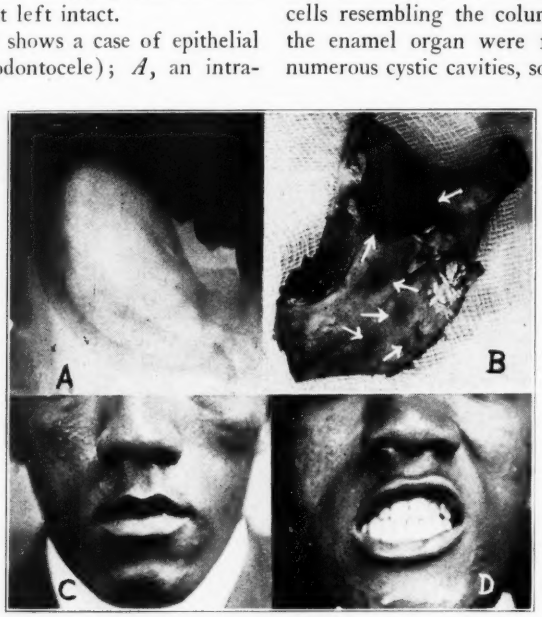

Fig. 13.—*A*, epithelial odontome involving the entire ramus of the right side of the mandible. *B*, specimen removed intraorally; *C*, appearance of patient, showing absence of visible deformity; *D*, appearance of patient, showing relation of the teeth, which is as before operation.

Figure 12 shows a multilocular cystic odontome, occurring in a young woman, which had destroyed nearly all the medullary bone of the ramus of the mandible. At operation an incision in the mouth beginning at the outer side of the coronoid process and carried

downward just external to anterior border of the ramus was made. When it reached a point opposite the second molar, it was curved forward and downward and continued in this direction to the inferior border of the mandible. A subperiosteal resection of the entire external plate of the ramus was made through this incision, the cystic cavities being thus exposed, after which the cysts and the third molar were removed. The periosteum which had covered the external plate of bone was then brought in contact with the raw bone surface of the inner plate by the use of a mattress suture of silver wire, carried from the skin surface through an opening made in the inner plate of bone, at *X* in Figure 12, over the anterior border of bone and back to the skin, and the desired tension was made by the use of buttons and perforated shot. After bringing a strip of rubber dam from the sigmoid notch to the skin, as shown in Figure 12, through a small incision, the primary incision was closed. The insert shows the buttons on the face and the strip of rubber dam used as a drain. The esthetic and functional results obtained in this case were most gratifying. *B* shows the amount of bone regenerated in three months. It is expected that, in time, the ramus will assume its normal contour and thickness. We have seen numerous instances in which this has occurred. There is a recognized biologic law that, when part of a bone is removed subperiosteally, and rebuilt, it tends to take on the normal contour. The method advocated permits utilization of this law.

Fig. 14.—Area of operation in case shown in Figure 13, a few months after operation. The location of the bone excision and the remaining molar tooth, in its normal occlusal relationship, may be noted.

Figure 13, *A*, shows an epithelial odontome involving the entire ramus. The operation performed in the case shown in Figure 12 would have been

indicated, but after the bone was exposed by the incision described in discussing the preceding case, the cystic cavity was opened to admit an exploring finger. It was then learned that the inner wall of bone was too thin and diseased to permit its retention, as were all walls. There were numerous areas in which the bone appeared to have no vitality. Arrows in *B*, Figure 13, point out several such areas. A subperiosteal intra-oral resection of the ramus was then made. Figure 13, *B*, shows the specimen removed. During the operation, troublesome hemorrhage was encountered, which necessitated ligation of the external carotid artery. An incision made in the neck to reach the artery and a buttonhole incision beneath the body of the mandible, for the passage of a Gigli saw, with which the mandible was resected, were the only incisions made on the skin. Immediate closure of the defect left after disarticulation of the ramus was carried out, fine catgut being employed. The wound was closed beginning at the deepest portion. Figure 13, *C*, shows the absence of visible deformity. Figure 13, *D*, shows the relation of the teeth, which is the same as before operation. The maxillary right cuspid occupies a position lingual to other teeth. Figure 14 shows the mandible a few months after operation. Function in this case is very satisfactory.

SURGICAL DRAINAGE

McGuire[2] states: "All surgeons drain some cases but some surgeons drain all cases." There is no reason to drain all mouth cases, and drainage should not be provided unless there is indication for it.

It should be recalled that surgical drainage includes far more than the physical fact that fluid will seek the lowest level and that it is a complicated biologic process arising out of the wonderful protective processes of the body. Surgical drainage is an abnormal and therefore a pathologic process. The question of surgical drainage is ably discussed by Horsley.[3] He says:

> In endothelial lined cavities or in solid tissue there is an attempt to wash away foreign irritating matter. This is done by pouring out of serum from the lymph circulation in the neighborhood of the foreign substance, which is accomplished by the reversal of the circulation in the local lymphatics so as to empty their contents around the irritating material. This is really the chief basis of surgical drainage. In surgical drainage mechanical measures that are followed by fortunate results would appear ridiculous if no biologic conditions existed. . . The drainage of a peritoneal abscess is practically always uphill and is usually successful. If mechanics were the only principle how could an appendical abscess ever be drained by putting a tube down to it through the abdominal incision? The whole problem of drainage really depends on the reversal of the circulation in the local lymphatics and is chiefly a biologic process. It is Nature's effort to extrude a foreign substance.

Materials for drainage about the mouth should be selected and used chiefly to permit the expeditious escape of wound secretions, pus, if present, blood, if hemorrhage is persistent, and broken down blood clots. Dependent drainage, while desirable, is not often necessary about the mouth. In immediate closure of wounds in the maxilla, dependent drainage into the mouth can be easily obtained without external incision. In the mandible, except in that

2. McGuire, Stuart: The Profit and Loss Account of Modern Medicine and Other Papers, Richmond, Va., Jenkins Publishing Co., 1915.

3. Horsley, J. S.: Operative Surgery, St. Louis, Mo., The Mosby Co., 1921.

portion of the ramus which lies above the superior border of the body of the mandible, external incision is necessary to obtain dependent drainage.

Of the available materials for drainage about the mouth, rubber tissue seems the best. Rubber tubing, if used, soon becomes clogged, and the secretions escape only along the tube sides, and in reality, the tubing does not provide for the escape of secretions any more readily than does rubber tissue. In addition, the tube leaves a much larger opening than does the tissue, and has to be filled in by granulation; while tissue permits the edges of the wounds to approximate more closely, thus lessening the amount of scar tissue.

Gauze is the least desirable of the available materials and should never be used in the mouth from choice. Its use in mouth wounds should be limited to the following indications: to control hemorrhages, to keep wounds open and to protect large raw surfaces, which, about the mouth, are often very painful, even on exposure to air. It cannot be too strongly emphasized that gauze as a material for drainage, other than as an irritant, thereby increasing the amount of lymph discharge, acts only by its capillarity. This capillarity would not be objectionable if it acted, and would continue to act only in one direction, drawing fluid from the wound into the mouth, but it also draws mouth fluids into the depth of the wound. As soon as gauze takes up all the fluid that it can absorb, which in the mouth occurs very rapidly, it no longer serves any good purpose but becomes an obstacle to the removal of fluid from the wound.

It is needless to call attention to the rapidity with which even a small amount of gauze would become foul in a normal mouth. To obtain its greatest value as material for drainage in the mouth, it becomes necessary to remove it frequently and to replace it with fresh gauze. Aside from this being impractical, it would violate what, in surgery, is a basic principle: namely, that handling a wound should be avoided as much as possible.

Plain catgut, freshly annealed silver wire and occasionally "dermal sutures," serve satisfactorily as suture materials. Care should be exercised that injury is not done structures such as the ducts of the salivary glands and the lingual nerve. A method of suturing used by C. C. Coleman, of Richmond, Va., in which the needle is first passed from the deeper portion of wound toward the surface and on the opposite side of the wound in a direction from the surface toward the deeper portion and tied, thus placing a knot in a reversed position to that usually occupied by it, has proved a great help in this work. Cold applications allay pain, lessen edema, tend to prevent postoperative hemorrhage and make suppuration less probable.

To prevent otalgia, the internal ear should be protected from cold by keeping dry cotton coated with petrolatum in the external ear. In connection with the use of tension, Blair[4] says:

> There are chiefly four basic things to be gained by the use of properly applied mechanical pressure to wounds, viz: the elimination of dead spaces; the control of oozing; the limitation of venous and lymph stasis; limitation of the amount of plastic material that pours into the wound. In wounds about the face and mouth the above factors combine to form a much more efficient preventive of sepsis than the most painstaking attempts at an asepic technic. . . . This is in no way meant to belittle the value of the standard

4. Blair, V. P.: The Influence of Mechanical Pressure on Wound Healing, Illinois M. J. 46: 249 (Oct.) 1924.

aseptic technic but rather to emphasize the fact that, in the healing of wounds, the latter is not the only adjuvant at our disposal.

If the vestibule of the mouth is obliterated, it can be restored by the use of epidermic inlays following the technic of Esser. Immediate closure is not indicated in acute infections involving the area to be operated on, until infection has been, by indicated methods, gotten under control.

Proficiency in this work increases with experience, and modifications in the application of the principles involved will readily suggest themselves to the experienced oral surgeon.

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DISCUSSION

Earle H. Thomas, Chicago, Ill.: Dr. Harrison says that surgery includes the correction of deformity and preservation of function, and with these sentiments I think we all heartily agree. As Dr. Truman W. Brophy used to say, "every surgical operation should be made with a view to leaving the parts in as nearly a normal anatomical condition as possible," and there is no question in my mind that the type of operation here described can be applied to a great many operative conditions to help produce the aforementioned result. However, I doubt that there is a very large percentage of operative cases which we might have reason to doubt were handled in the best manner when handled by other methods at present in general use. I should like to emphasize one statement made by Dr. Harrison: "The principles governing the successful practice of surgery, regardless of the field, are the same, but the application of these principles varies in different fields." His operation rests on sound surgical principles, but, of course, it entails disturbing surrounding normal tissue, which should not be done, unless it is impossible to get the desired result otherwise. Dr. Harrison mentions its particular application to nonerupted teeth, cysts and tumors. In most cases of nonerupted teeth and cysts, the desired end-result can be obtained with the usual methods. But in the case of tumors, when it is necessary to remove considerable of the surface tissues, the operation here described should be especially applicable and worthy of frequent use. Whether this method will lessen postoperative discomfort is open to question. Usually, after careful surgery, marked discomfort is limited to the first twelve hours, and the amount of discomfort is in direct proportion to the amount of surgical interference, and the length of time that the tissues are traumatized. Consequently, any additional surgery, which Dr. Harrison's flap operation appears to be, would necessarily cause more reaction. There is no question that his method will shorten the time of healing at the site of operation, and also shorten the period of observation of the case. In the removal of cysts, the most important thing is good judgment in choosing the site of incision. In cysts that have destroyed most of the bone underlying the ridge of the jaw, in edentulous mouths and even in others, the incisions should be on the buccal and farther from the ridge than the periphery of the denture. With curved instruments, the cyst lining may be peeled away from the under surface of the ridge and the patient may continue to wear the denture without interference. In such cases, the overlying tissues are usually sutured in their original position. With a small cyst, I leave no drainage, but, if necessary, make an opening between two of the sutures every second day with a fine instrument in order to evacuate all excess serum. It would be necessary to continue this treatment only a week or so. In large cysts, I usually do not pack, but, anticipating the probable breaking down of the blood clot, leave a small gauze drain between two of the sutures, and carry out all necessary irrigation through this small opening until the cavity has become filled with granulations. Maintaining the minimum size of the opening, we have granulation developing from all sides of the cavity, thus hastening the healing. Handling cyst cavities in this manner will not result in deforming and annoying depressions, and it also follows the surgical principle of entailing as little interference with the healing wound as possible. As Dr. Harrison states, one requisite for successful plastic operations is avoidance of spaces in which there is no tissue, and while at first thought the foregoing method of handling cysts would seem to be contradictory to this principle, this method does overcome edema and allow the escape of normal wound secretions. The question of drainage up hill has never been a question with me. It

matters not whether it is up or down, as long as the pressure of the secretions have an outlet; as long as a large cavity requiring drainage is not sealed, almost anything will do. Along this line, it might be mentioned that external incision is not indicated in a majority of the acute infections along the lower border of the mandible; they can usually be sufficiently drained through incisions on the buccal or lingual surface. Dr. Harrison seems to have a grudge against iodoform gauze, calling it the least desirable of the available materials and saying that its use should be limited to the control of hemorrhage, to keep wounds open, and to protect large raw surfaces. Except in these cases, nothing need be used. Furthermore, I do not believe that gauze promotes drainage by its capillarity, because its capillary action is ended a few seconds after saliva flows on the gauze, and yet I have found it most efficient for drainage. This immediate stoppage of capillary action prevents the continual drawing of mouth secretions into the depth of the wound, and, furthermore, little of the mouth secretions enter the depths of these cavities, because there is a slow, constant flow of fluid outward through the gauze and the spaces between the folds of gauze, owing to the positive pressure of the wound secretions. Of course, it is understood that there would not be much drainage if the gauze were packed tight.

The length of time iodoform gauze may remain in the mouth without becoming foul depends on the acuteness and the type of infection. Of course, rubber tissues can be used in the same manner as iodoform gauze, but I have always had a preference for the gauze. I agree that rubber tubing often causes more harm than good. One might think that, in Dr. Harrison's operation, when he sutures the cheek deep into the bone and leaves, at the time, a marked depression, there would be a depression left in the cheek which would be a deformity. But Nature always tries to round out everything, and after these buttons are removed, I understand the cheek comes back to normal contour, so that there is no objection on that score. I have not tried this operation, and I am not competent to say how good it is, but I understand that Dr. Harrison has operated hundreds of times in this manner, and with the results he showed with his casts and with the pictures, I think that it is a very valuable method and worth every one's investigating to see if they cannot apply it in practice.

Herbert E. Guthrie, Huntington, W. Va.: There is one point that has left me in the dark in regard to taking out these large cysts. What about the inferior dental nerve? What is going to be the result if this nerve is taken out? What about the teeth remaining on that side that are going to be nonvital? I would appreciate very much his explaining that point.

Arthur E. Smith, Los Angeles, Calif.: It seems to me that there might be a severing of the continuity of the facial expression; that there might be some interference with the cosmetic effect. I think such a thing may be more important in connection with a woman patient than with a man. I should like to ask what the postoperative effects are, in regard to formation of scar tissue and changing of facial expression.

V. H. Kazanjian, Boston, Mass.: I wish to ask for more information about the case of adamantinoma involving the ramus of the jaw. As I understand it, Dr. Harrison used the same method of treatment in this case as in treating benign cysts of the jaw. I believe that adamantinomas, being essentially epithelial and locally malignant tumors, and in some instances showing a tendency to involve the neighboring lymph glands, should receive more radical treatment in order to effect a permanent cure. I consider Dr. Harrison's method of closing the wounds an essentially sound and conservative one in treating most benign cysts of the jaw. In the treatment of infected cysts, immediate closure of the wound may not be desirable. A cystic cavity in the immediate neighborhood of the maxillary antrum may be successfully treated by being joined to the antrum. In this case, it is advisable to make an intranasal opening through the inferior meatus. One type of cystic cavity that always bothers me is located in the anterior part of the upper jaw, extending toward the floor of the nose. In these cases, it has been possible to allow blood to collect and organize, obliterating the cystic cavity, provided the case is not complicated previously with infection.

G. H. Wright, Boston, Mass.: In operating for multilocular cysts or any other type of cysts, where we have a noninfected cavity, I find great virtue in packing the cavity very hard with dry gauze for five hours, merely

to set up a counter irritation and a stimulation of the wound, then removing the gauze and closing the wound. I want to ask whether Dr. Harrison is in sympathy with that method.

Henry S. Dunning, New York City: This is an original and ingenious method, one which I have never seen published anywhere before, and the results are beautiful. And, since Dr. Harrison has employed it in hundreds of cases, I think it is a type of treatment we ought to follow and work out, probably further than he has at this time. I believe that it will work out in many cases in which there is a local infection and in chronic cases where the pathologic process has been overcome. I believe that it is not well to leave the "open spaces" and the dead spaces, and if we can have a certain operation that will leave the parts as nearly normal as possible, that is, after all, our greatest aim in our work.

Dr. Harrison (closing): My experience with these methods shows that they aid Nature by observing the principles she uses in wound repair. Dr. Thomas spoke of wound cavities in the jaws filling in with granulations. My observations lead me to believe he should have said "with pusy granulations." Drainage and materials for drainage were discussed as it was realized that under these heads would come possible objections. It is believed that careful reading of the paper will answer any objections raised. I fail to see how the direction of the capillary flow on gauze can be controlled. Dr. Thomas spoke of the two operations. I wish to be understood as advocating principles and not types of operations, and I spoke of modifications of the methods to meet varied conditions which would suggest themselves to the experienced oral surgeon. Clinically, the muscle tissue utilized, when covered with periosteum, is replaced to a large extent with bone. Periosteum is a limiting membrane, a mold, for bone, and, for this reason, subperiosteal excision of bone is advocated. Bone regeneration in the maxilla is not so satisfactory as in the mandible. Histologic characteristics explain this. Cutting the mandibular nerve in the body of the mandible is not considered by oral surgeons as serious. It may result in temporary loss of sensation in the pulps of the teeth, but not necessarily death of the pulp. Flaps correctly designed and sutured will not cause facial deformity. The large amount of mobility of the tissues about the face is a great aid, and experience teaches one to make use of this mobility. I consider Dr. Kazanjian's statement that these methods of treating wounds are conservative to be the strongest point in favor of the precedures. I fail to see the rationale of using gauze as mentioned by Dr. Wright. It is gratifying that Dr. Dunning believes this to be original. I trust that it will prove useful.

THE PATHOLOGY OF OCCLUSION*

By PAUL R. STILLMAN, D.D.S., F.A.C.D., F.A.A.P., New York City

THE members of this section are dentists who have acquired a special interest in mouths from which one or more teeth have been lost through disease. Their desires have been crystallized from a more or less vague intention merely to replace the missing teeth, to a definite wish that this replacement be made in such a way as not to jeopardize the health of the remaining teeth of the mouth. In order that the problem may be fully solved, it thus becomes necessary that we understand the nature and causes of the disease processes which produced the original loss of the teeth. It is necessary, in other words, that the pathogenic forces which were originally operating in the mouth be checked in their course; and it is quite as imperative that there be no new pathogenic forces brought into the mouth through the agency of the restoration. The partial denture worker, it will thus be seen, although his problems are largely mechanical, must understand oral pathology quite as well as the dentist whose efforts are directed along the line of therapeutics.

I have said that the problem of the partial denture worker is largely mechanical. It also happens that the problem of disease with which he must be familiar has its foundation also in the mechanical. This seeming paradox furnishes the basis for this paper. Dentists, in spite of the very nature of their professional work, have failed to appreciate how fully the teeth and their associated structures may be likened to a machine. We are familiar with the problems of anatomic articulation, as applied to full denture construction, and recognize it as a problem in biologic engineering. What we sometimes fail to realize is that the natural dentition, having the same function as the artificial one, will be governed by the same laws of mechanics; and we furthermore fail to remember that violation of these laws will produce a certain disturbance in the natural dentition as it will in the artificial denture.

Chayes,[1] more than ten years ago, stated an important fact:

> In health, teeth and gums, and, in fact, all the organs in the body, perform their function as a matter of grateful exercise without undue consciousness on the part of the animal, contributing to the maintenance of an efficient organization in which the income is greater than the expenditure to obtain this income. But, in order to obtain such a condition, we must have perfect interplay of all organs making up the animal body, and the first requisite for perfect interplay is absolute lack of interference by one organ with any other one or more organs.

*Read before the Section on Partial Denture Prosthesis at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

1. Chayes, H. E. S.: Bridgework Conducive to Health and the Instruments for Constructing It, Dent. Items Int., 37: 420 (July) 1915.

Disease is, according to modern pathology, definitely linked with changes in structure and function. Not only does disease produce changes in structure and function; changes in structure and function, no matter how produced, will inevitably lead to disease. Starting, then, with a healthy mouth containing sound teeth, we most commonly find that disease is introduced through a disturbance of function. This is true of several types of caries and apparently true of all forms of periodontal disease.

I have been a close student of traumatic occlusion for many years. At first, my interest in it centered largely in those cases in which the presence of this pathogenic agency had resulted in periodontal disease. In the course of my practice, I have had frequent occasion, as a consultant, to study cases in which there were none of the symptoms of the usual forms of periodontal disease, but which I nevertheless traced readily to traumatic occlusion. It is beside the purpose of this paper to elaborate on the various occurrences. I merely mention this in order to give force to my contention that traumatic occlusion, which is nothing more or less than a mechanical disturbance of function, is back of many diverse disease conditions which occur in the mouth and which are responsible for the loss of teeth. While traumatic occlusion is not the sole cause of these diseases, it occupies a prominent place in their etiology, more prominent than is usually realized. To deal properly with these diseases, then, it is essential that we understand what traumatic occlusion is, recognize it when present and eliminate it from the field of our operations.

Traumatic occlusion has been defined so often that it would seem trite to attempt elucidation as to what it is. However, it is well that we always keep in mind the fact that traumatic occlusion is an indication of, and is due to, a lack of balance in the occlusal relations of the teeth of the mandible and maxilla. What is more pertinent to the subject of this paper is the consideration of diagnosis. How may we detect traumatic occlusion? It may be detected by study directed from one of two viewpoints. First, if the mechanical relation of the teeth themselves presents an obvious departure from symmetry and coordination, the presence of an injurious occlusal relation may be dogmatically asserted, irrespective of the presence or absence of disease. This is of special importance to the partial denture worker. Second, the form and color of the gingival tissues and, to a certain extent, the color of the teeth themselves will offer an index to the presence of this condition. An injurious occlusal relation may be present without visible evidence of disease, or, on the other hand, there may be evidence of disease when the occlusion on superficial examination seems to be normal. Either one of these conditions should be a matter of concern to the partial denture worker.

When it becomes necessary to insert a partial restoration, it is obvious that we are putting an unnatural structure into the mouth. To preserve health under such circumstances is unquestionably more difficult than in the mouth that is free of this burden. When such restoration is needed, the dentist must focus, even more sharply than before, on the causes of the disease that has already been established in that mouth. He should in the first place ascertain by inquiry the nature of the disease through which the missing teeth were lost.

I have already spoken of the part which traumatic occlusion may play in the production of caries. The denture worker who deals with a case in which caries has done much damage is apt to think of his problem as being principally wrapped up in the question of avoiding all possible contact with the natural tooth surfaces, so as to facilitate their cleansing. The thought that traumatic occlusion may have had much to do with the incidence of caries in the mouth, and that this same agency may continue to induce a recurrence of the disturbance, may be new to some. To attain the highest degree of success in the management of such a case, it will be necessary to plan for the elimination of the traumatic occlusion. It has been my observation that the healthy mouth is also a clean mouth. I have noticed repeatedly that when the teeth show an unnatural tendency to collect deposits, both calcareous and those commonly spoken of as plaques, there is a disturbance of the circulation in the gingivae, which I have been unable to trace to traumatic occlusion. I furthermore have noticed a marked improvement in the condition of the tooth surface itself when this condition is corrected.

What more commonly enlists the attention of the dentist making a partial restoration is the case in which the missing teeth have been lost through periodontal disease. He will be alert as to the presence of loose teeth, or those showing fairly advanced periodontal lesions. As to the relationship between such teeth and traumatic occlusion, I need make no comment. On the other hand, I do wish to emphasize the early signs of periodontal disease as demonstrated by more latent symptoms. Here, we must depend on variations from the normal color and form of the gingivae, together with variations from the normal, as seen in the radiogram. When such variations are seen, the attention of the dentist should at once be focused on a study of the occlusion. In these cases, there will almost invariably be found a disbalance of the occlusal relation.

Another aspect of this subject is to be developed around the question of the form and surface contours of the teeth, both natural and artificial. Any part of the body that is deprived of normal function through deformity will fail to exhibit the highest degree of health. We recognize this instinctively, as, for instance, in the case of the lanky, round-shouldered man. This example needs no elaboration; but we fail oftentimes to draw a similar conclusion regarding the state of health of the mouth in which deformity is even more glaring. We know instinctively that the dentition in which the incisors are long and unworn on their incisal surfaces is incapable of normal function; yet we fail to realize that, in such a mouth, disease must sooner or later intrude itself, if it is not already present. This is an example of a deformity due often to the position of the teeth themselves, and deformity of position with its consequent disturbance of function may be found in any part of the mouth. Another type of deformity is that of the tooth itself, due either to congenital malformation or to asymmetrical wear. Lack of normal wear frequently introduces into the natural dentition one of the most difficult manifestations of traumatic occlusion that the periodontist is called on to treat.

The first concern of the partial denture engineer, after he has assured himself of the healthy condition of the remaining natural teeth, should be the

occlusal relation of those teeth. To cite a common example: It frequently happens that several of the upper anterior teeth have been lost and are to be replaced. Almost invariably, it will be found that the lower incisors and cuspids show little or no incisal wear and, in fact, are elongated. It also frequently happens that, while one or more may be worn, the others are elongated. With any of these conditions, it is essential that these teeth be remodeled so as to present both the appearance and the fact of functional symmetry. Another instance commonly found is that of the loss of the upper bicuspids. Here it will be found that the lower bicuspids, and usually the first molars, present evident elongation or an abnormal height of cusp. To insert bridges, or a denture, without remodeling the lower teeth will inevitably result in transferring to the upper abutment teeth the occlusal strain that was largely responsible for the loss of the missing bicuspids. Even when the restoration of only a single tooth is involved, it will frequently be found, on careful inspection, that the cusps of the opposing teeth or tooth exhibit a form that makes clear their lack of functional symmetry. To make restorations without the correction of these conditions will inevitably mean the reintroduction of traumatic occlusion into these cases, with consequent disease.

The first duty that the dentist owes the patient requiring a partial restoration is to see to it that the remaining natural teeth are remodeled to an extent that will equal the probable natural wear on those teeth at the age of the patient. This must include not only those natural teeth which are to come into occlusion with the restoration, but also those natural teeth that have natural antagonists. In performing this operation, due thought must be given to the curve of Spee. This may best be determined, for the case at hand, by the study of cases mounted on a suitable articulating instrument. This remodeling must all be done before the restoration is begun, and particularly before the bite is taken. I do not doubt that everyone in this audience has had the disagreeable experience of attempting to set up artificial teeth for a bridge or a partial denture, only to find some plaster tooth balking his efforts to produce that which he thinks the patient should have. He may not have visualized fully the necessity of symmetry from the functional standpoint, but he at least realizes the incongruity from the standpoint of esthetics.

The dentist when faced with this situation, is forced to do one of two things: Either he will accept the deformity as it existed in the mouth, or he will arbitrarily trim down the plaster tooth with the idea of doing a corresponding amount of trimming on the natural tooth after the completion of the case. Either of these methods is illogical, and will almost invariably lead to disease. If balanced occlusion is accepted as the foundation of the healthy mouth; if it is the *sine qua non* of the stable denture, how important it is that the balancing of the occlusion be done as the first step in the program of restoration.

What has been said about the remodeling of the natural teeth applies with equal force to the management of the artificial teeth. Not only must they be so placed as to meet their opponents in anatomic coordination; they must have symmetry of form and profile outline that will make them an integral part of the restored dentition. This includes

the shaping of the incisal and occlusal surfaces to conform to the amount of wear natural to the situation; the assurance of normal buccolingual and mesiodistal diameters; the provision of anatomic contours from every angle of their profile; and the correct posture of the teeth themselves in the arch. These things are all intimately concerned in the restoration of function. Without them, or any one of them, we shall not only fall short of our ideal, but also will prejudice the health of the entire dentition.

We are familiar with the fact that many partial dentures and bridges have not only failed to give their wearers comfort and satisfaction, but also have actually been responsible for the loss of other teeth in the mouth. Moreover, it is frequently found necessary, in treating disease, to remove much restorative work that had recently been placed in the mouths of patients. This removal has been necessitated by the lack of harmony in these pieces as exhibited in the relations between the mandible and maxilla, and the consequent impossibility of restoring health under such conditions.

The idea of attacking the restoration problem from the standpoint I have herein presented may be new to some bridge and partial denture workers. Its practicability is, however, attested by many of my colleagues who have been utilizing this principle in the construction of their partial restorations for some years. The results that have been attained through this method of practice have justified my urging its adoption.

Health is dependent on function. "Beauty" and "health" are synonyms, and the symmetry that constitutes beauty is essential for normal function.

DISCUSSION

Harvey Stallard, San Diego, Calif.: I agree with Dr. Stillman that the partial denture worker must understand better the nature and causes of the diseases producing the original loss of teeth in order to check the old pathogenic forces and prevent introducing new ones through the restorations. I suspect that the partial denture maker who ignores both the etiology of dental diseases and the mechanical principles of occlusion only accidentally benefits his patients and, ordinarily, does nothing except injury to his patients, assuring them that everything will be better when they have all their teeth out and can have full dentures, the making of partial dentures being a "tiding-over" process. The orthodontist, by seeking to obtain and maintain occlusions, heedless of etiologic factors, will have only a small percentage of successes, empirically derived, not by rational procedures. I read recently a statement of a surgeon that drainage of the gallbladder was of no permanent value unless the patient corrected his diet and habits of life. No doubt, Dr. Stillman would agree that partial dentures should be corrective and preventive as well as restorative; in other words, the partial denture should be, in part, a therapeutic remedy.[2] Doubtless, Dr. Stillman would also agree that corrective restorations cannot be permanent unless the active causes of disease, or at least their dangerous symptoms are removed, and the dentists' efforts fail unless they prevent continuation or recurrence of disease. Dentists often disdain interest in etiology, because, they say, they know little about causes, and, since the deformity or disease is present, they must rectify or relieve conditions at once, and they assert that those doing preventive dentistry alone should be interested in etiology. The familiar comparison used to justify their claims is, "When a house is afire, it's none of the fireman's business how it got on fire, it's his business to put it out." But, as a matter of fact, after the fireman has the fire under control, he invariably makes a search for the cause, for two reasons: (1) to put the flames out permanently, and (2) to prevent other fires. Besides, in well regulated cities, there are fire-orders, intended to prevent fires, and fire inspectors make routine examinations, etc. Of

2. McCollum, B. B.: Removable Bridgework, J.A.D.A., 11: 256 (March) 1924.

course, a man having poor technical ability can base alibis of failures on claims of inability to treat the mouth in advanced stages of disease, but, as this subject has been presented here by Dr. Stillman, ignorance as to etiology cannot be used as an alibi. Instead of etiologic studies making us shiftless in our technic, as some fear, they should aid us in treatment by whatever rational therapy we use. If we know the causes of malocclusion, periodontoclasia or caries, we can correct and repair enthusiastically, knowing that our efforts will not fail. We can strive harder for the ideal, knowing that the more ideal conditions can be created by removing the cause. I sympathize with the dentist when he loses interest in etiology because he lacks faith in alleged etiologic factors. We know far too little about causes of dental diseases and deformities. There is no sharp line between disease and health. Disease appears to be an inability of an organism, organ or tissue to harmonize with its environment without too much self-destruction. Diseased organs function at the peril of their lives. Herbert Spencer once said, in effect, that an organism could live forever if it had a perfect environment and had the ability to respond perfectly. Nowadays, we have one group of dentists who believe that the occlusal surfaces, their sizes, shapes and peculiar sculpture are perfect at eruption, are impossible of improvement by the act of grinding, and will not wear out if used on gritless foods, but, peradventure, these perfectionists say, if they do wear, they will be self-sharpening. Then we have another group who always want to improve on the shapes, sizes, etc., of the occlusal surfaces. We have had, and still have (in Africa), the savage custom of filing in between the teeth. In fact, filing off contact points for prophylactic purposes was practiced and advised by "filing enthusiasts" until about 1887, when Dr. Davenport, of Paris[3] challenged their theories. Since then, such mutilations became less frequent, until today every dentist realizes the folly of such procedures. Then, a certain prophylactic operator advocated grinding off gingival ridges and supplemental ridges, and polishing the teeth until they were slick. This practice made the teeth sensitive, destroyed their beauty and defunctionalized them somewhat. I believe that Dr. Stillman condemns this practice. But he belongs to a more modern school of "grinders," attacking the most important functional part of a tooth. It is not altogether a new idea, as Dr. Stillman admits (in fact, he does not claim or even hint at priority), for dentists often set a bridge too high, and instead of grinding off the gold veneer of the bridge, which, of course, would weaken it, grind off the opposing teeth, a practice which our essayists rightly considers illogical. Orthodontists have ground permanent teeth to straighten them (Farrar), and they, too, "got results," and "were successful clinically." They "cured." One operator tried grinding teeth in narrowed deciduous dentures to correct malocclusion. As near as the process could be interpreted, he "remodeled the occlusal surfaces," ground down cusps, ground in new cusps, and actually made a semblance of normal occlusion which seemed, on superficial examinations, remarkable. A certain amount of expansion, quite to my surprise, was gained. I suppose that this dentist also recognized etiologic factors, for, undoubtedly, to him the cause of malocclusion was perverted cusp and inclined plane relations. He didn't expand the jaws; he didn't move the teeth; he destroyed the original occlusion and ground in an artificial one which would "articulate." However, I don't believe this is the most rational method of treatment. Dr. Joseph Gruenberg, of Berlin,[4] once advocated grinding of the occlusal surfaces in order to improve occlusion and make favorable prognosis of orthodontic corrections surer, claiming that, unless the inclined planes meshed thoroughly, the teeth would return to original conditions. I don't believe that he ever accused "lack of proper wear" of being responsible for the rotations and misplacements in malocclusion. "Spot grinding" of the teeth of plate dentures is nearly always done, but a dentist should master his technic so that he can have a minimum amount of that to do. One dentist demonstrated how well he could make artificial dentures on any sort of an articulator, even on a door hinge, but, of course, he had to resort to "spot grinding." For the ordinary man, it would be better to remount the case on an articulator and remill, so hard is it to do "spot grinding"

3. Davenport, I. B.: Dent. Cosmos, 29: 413 (July) 1887.

4. Gruenberg, Joseph: Am. Orthodontist, May, 1908.

without ruining the function of the artificial teeth. With the advent of carborundum paste, milling in teeth, a process that destroys the cutting surfaces of the molars, but which gives more freedom to the jaw movements and better balanced occlusion, has become easier. But after this "milling in" has been done, I believe with Dr. McCollum that these teeth should undergo occlusal sculpturing. So, it seems to me, "spot grinding" of the occlusal surfaces, a hazardous job in artificial teeth, is even more hazardous in natural occlusal surfaces. A skillful dentist will not need to resort to it if he is shown a better way of restoring function and health to the denture. On the other hand, the use of carborundum paste in the natural teeth is a "shot-gun" method of grinding off the functioning occlusal surfaces. Occasionally, a maker of articulators shows how dentists may mount plaster casts of natural teeth to determine which teeth should be ground. By this technic, the dentist will usually grind off the very cusps that are "trying their best to save the day—trying to maintain the correct relations of the jaws." Dr. Stillman's idea of grinding, and he even admits it, is to take away from "sick" teeth their function, giving the teeth a sort of a physiologic rest. I am somewhat disappointed that he did not take up more in detail the "pathology of occlusion." I understand that we can have occlusal surface relations that will give trouble to the tissues and destroy too readily the surfaces of the teeth, but occlusion is merely a closing relationship—not a cell, tissue or organ. Pathology should have a cellular foundation. It is unfortunate, perhaps, that we have created so much vagueness and reverence around and for the word occlusion. One would almost suppose that teeth are made to serve occlusion instead of occlusion serving the teeth. Dr. Stillman has emphasized "traumatic occlusion," which is defined so often, though Dr. Prinz positively asserts that it does not exist. "Occlusal trauma," used synonymously by Dr. Stillman, is rather more definite. I believe that it would be more to the point to talk about trauma caused by malocclusion. Dr. Stillman has been telling partial-denture makers how to insert their fabrications, occasionally referring to occlusal trauma, with some advice on grinding, or reshaping, the occlusal surfaces. It seems to me that teeth should occlude so that they chop up food and, if the denture wears down, it should be repaired by "shoeing the teeth" instead of paring them. I know that Dr. Stillman favors full restoration of the mouth to function and health, but I believe his advice in regard to partial denture construction would lead men to temporizing with occlusion instead of thoroughly reconstructing the occlusal surfaces. Perhaps my fears arise from misconceptions. Partial dentures and bridges are aptly called "partial restorations," for they restore function and health only partly in the majority of patients. Of course, Dr. Stillman believes that bridges and other dental inserts should be used in conjunction with other dental work to restore fully. I should like to know more about trauma of malocclusion. I wonder whether it is a cause or a symptom of periodontal disease. In order to acquire such knowledge, even clinically, dentists will have to keep more accurate methods of recording occlusions in well made casts mounted on articulators, over a long period of years, for patients whose diet, habits and environments are well known and recorded. It seems to me that the improvements following grinding are largely due to defunctionalizing. If occlusal trauma, by lowering the vitality of the gingivae, causes deposits of plaques and calculus on teeth, what causes similar depositions on the lingual surfaces of rubber plates? Why would it not be more feasible to raise the bite by increasing the height of short molars and bicuspids, thereby relieving the "overfunctioning" incisors, than to grind the latter off? Could not physiologic rest be obtained by other than destructive methods? Is the curve of Spee necessary for balanced occlusion or for the best balance? and why? Is the curve of Spee caused by the movements of the mandible, or is it a historical path of development? Is it wrong to give artificial teeth of plates or bridges the same occlusal sculpture as in the young adult? Should occlusal inlays in children be made devoid of secondary grooves and ridges? Would it not be better to restore all the tooth surface of a denture into occlusion rather than to place a dull occlusal inlay and then grind away the enamel of the other teeth? Perhaps it would not be amiss to call dull occlusal inlays partial restorations, since they cannot functionally match the original structures. How do we know what the "normal wear" should be for a given age? how determine it or record it? Isn't this like calling hyper-

metropia and presbyopia normal at the age of 50? Some dentists are strongly of the opinion that grinding merely helps functions destroy the surfaces of the teeth. They say that we have learned the importance of restoring the profile and contour surfaces and contacts of teeth, but they claim we have not learned how to restore occlusal surfaces, the most important parts of teeth, and they believe that we should do this to make the patient eat better and have a healthier mouth, not to cure him of all manner of physical and mental ailments. Can Dr. Stillman allay these fears? And I should like to ask how he aligns his theories as regards periodontoclasia with those of Fleishmann and Gottlieb?

Dr. Stillman (closing): Dr. Stallard makes a somewhat facetious reference to the modern school of grinders, stating that in the correction of traumatic occlusion, I "attack the most important functional part of a tooth." This, with the statements which follow it, gives the impression that Dr. Stallard considers any grinding of an occlusal surface an improper procedure. He also refers to spot grinding as a procedure which is not to be recommended. Let me remind him that wear of occlusal surfaces invariably occurs with function; that the occlusal surfaces have the thickest layer of enamel to provide for such wear; that the wear is roughly in proportion to the age for those cases having a functional occlusion; and, finally, that Nature indicates the necessity for wear taking place through the incidence of disease, when such wear is either lacking or deforming. My object in grinding occlusal surfaces is invariably to supply the missing natural wear. It has been my observation that the grinding which I do improves and does not impair function. Dr. Stallard has his misgivings aroused by my advice that a partial denture worker should remodel the occlusal surfaces of the natural teeth before proceeding to the construction of his restoration. He says that his fears may arise from misconception. With this statement, I agree. Such grinding as I recommend will invariably improve function and will not result in closing the bite, of which he is also fearful. This statement is, of course, predicted on the assumption that the grinding is done with intelligence. The same, of course, will follow for so-called spot grinding. The markings of the carbon paper are not to be followed blindly. Such a course would lead only to destruction. Dr. Stallard wishes to know more about trauma of malocclusion. He here opens a subject not included in my paper, as also in his question regarding my conception of periodontoclasia as compared with that of Fleishmann and Gottlieb. Unfortunately, I shall have to forego answering these questions for lack of time. Their elucidation assumes a certain amount of preliminary reading. May I refer Dr. Stallard to the textbook[5] by Dr. McCall and myself, and also to Dr. Box's epoch-making work on periodontal pathology published by the Canadian Dental Research Foundation. Physiologic rest is a requisite for the healing of injured bone. Grinding provides physiologic rest for a certain period of time; and, if this is what Dr. Stallard means by defunctionalizing, I agree with his theory regarding the improvement which follows grinding. But it must be understood that such "defunctionalizing" is temporary only, if the occlusal surfaces are properly remodeled. Disocclusion, which may be the immediate result of grinding, gives way to normal function with the early elongation of the tooth into occlusal contact with its antagonists. This is not what I would call defunctionalizing. In studying the relationship between the incisors and the posterior teeth, I frequently find cases in which building of the posteriors is indicated. I make no hard and fast rule as to the shortening of incisors; I study my cases and endeavor to use common sense.

5. Stillman, P. R., and McCall, J. O.: Textbook of Clinical Periodontia, New York, Macmillan and Company, 1924.

PHYSIOLOGIC OCCLUSION*

By J. LOWE YOUNG, D.D.S., New York City

IN order to avoid misunderstanding, it is deemed advisable first to define physiologic occlusion. Anthony's dental dictionary gives the following: "Physiologic. Relating to physiology, especially to normal as distinguished from pathological physiology." "Occlusion. The normal relations of the occlusal inclined planes of the teeth when the jaws are closed."

Anthony does not define "balanced occlusion," so, in order to avoid misunderstanding, I will give my conception of this term. Balanced occlusion of the human dental apparatus is that arrangement of the teeth of the maxilla and mandible which provides freedom from cuspal or incisal interference when the mandible is in centric, or any excentric position, and which provides that all the teeth in one jaw are in perfect coordination with all the teeth in the opposing jaw. Needless to say, this is a condition that is extremely rare in the human dental apparatus. This term was originally applied to the arrangement of teeth in an artificial denture, but has been applied recently, especially by periodontists, to the arrangement of teeth in the natural dentition. While it is seldom found in the arrangement of the natural teeth, it may often, but not always, be brought about through harmonious wear, or by occlusal adjustment.

Since physiologic occlusion, a condition that does not produce disease, may occur even without that fine adjustment which is implied in the term balanced occlusion, it will be obvious that the terms physiologic occlusion and balanced occlusion are not necessarily synonymous. It is safe to say that balanced occlusion will always be physiologic. We frequently see natural dentures which are not in balanced occlusion, but which are, as far as we can determine, in a state of health. We naturally assume that they are in a state of physiologic occlusion. Since the state of health may be due to high resistance rather than freedom from injurious occlusal relations, and since disease may later show itself in these same mouths, it is not safe to assert that any denture that exhibits a present state of health is in physiologic occlusion. In the majority of cases, it may be said that physiologic occlusion is a condition synonymous with that condition which Angle defines as normal occlusion, the definition of which will be given later.

Angle states that "the line of occlusion is the line with which, in form and position, according to type, the teeth must be in harmony, if in normal occlusion." This is not a geometric line, but varies from case to case. There

*Read before the Section on Partial Denture Prosthesis at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

can be but one true line of occlusion for each case, and the line of occlusion must, in each instance, be determined by the observer in the light of his knowledge and experience. It must be visualized in each and every case, and should be regarded as the basic ideal of the dental apparatus. This basic ideal applies not only to cases requiring orthodontic treatment, but also to all dentures requiring periodontic treatment or restoration.

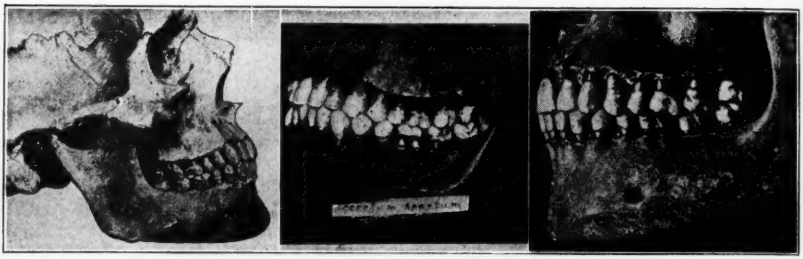

Fig. 1.—Ideal individual types. (After Angle.)

To comprehend most readily what this basic ideal means, many accurate plaster models of cases with the full complement of teeth in normal occlusion should be studied. Skulls, of course, are preferable, but they are much harder to obtain and should be carefully scrutinized to see that teeth that do not belong or are of an entirely different type have not been substituted in place of the lost ones. In the absence of these, good photographs are helpful; but it is so difficult to photograph the lingual arrangement of the cusps that much of the value to be obtained in the study of the teeth in normal occlusion is lost, when studying photographs of either models or skulls.

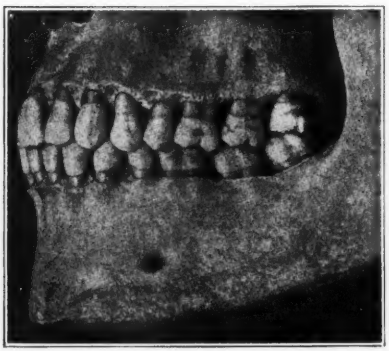

Fig. 2.—A beautiful specimen of normal occlusion.

Fig. 3.—A half skull, lingual view.

When all the teeth are in harmony

with this line of occlusion, and the inclination of their roots is normal, and without torsion, there will be proper coordination of all the cusps and incisal surfaces in centric occlusion. Teeth so placed are in the best possible position to be self-cleansing and therefore are least liable to decay. They also offer the best protection to their investing tissues.

When the teeth develop in this beautiful form, the permanent first molars erupt first, directly back of the second deciduous molars, and, when in proper coordination, they act as the mainstay of the dental apparatus during the shedding of the deciduous teeth and the eruption of their permanent successors. Whenever the permanent first molars fail to assume their proper positions when they come into occlusion with their antagonists, it is almost certain that some, if not all, of the remaining permanent teeth will fail to assume their proper positions in the arch, and will thus fail to be in harmony with their antagonists.

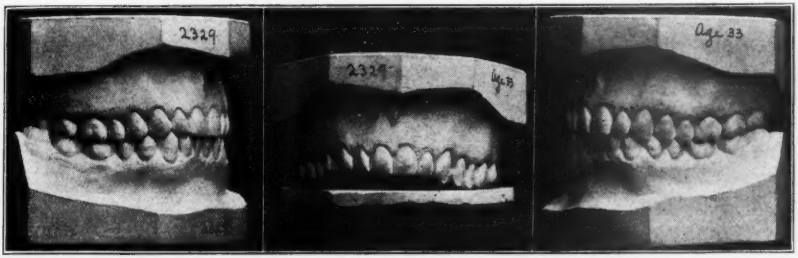

Fig. 4.—Left and right: Models showing anterior buccal views of each side of a set of beautifully arranged teeth that developed normally. The third molar relation on the right side should be noted. Center: Upper half of model, placed on a plane surface, showing how short the anterior teeth are in relation to the first molars.

Thorough mastication of proper foods during this developmental period is of the utmost importance in bringing about this harmonious relation; for, as should be apparent to every close ob-

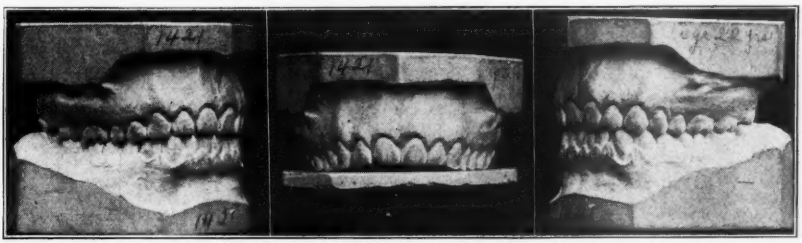

Fig. 5.—Models of another set of teeth that developed normally. The condition of the gingival tissues should be noted.

server, when a tooth first erupts, the pressure necessary to move it is exceedingly slight in comparison with the pressure required to move a tooth with the roots fully formed and the surrounding bone completely developed.

In passing, we must state that the greatest service the orthodontist can render his patient is to guide the erupting teeth into their proper positions so that the teeth in each jaw are in harmony with the line of occlusion, and then it will be found that all the teeth in each jaw are in harmony with the teeth in the opposing jaw.

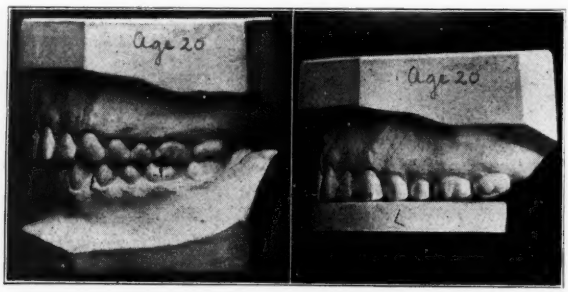

Fig. 6.—Left: Model of teeth designated by the author as showing the most beautiful arrangement he had ever seen. A lingual view shows almost ideal relation. The case had never been treated orthodontically. Right: Upper half of model placed on a plane surface, showing all of the teeth, back to the first molars in contact.

It will also be found that there is proper coordination of all the units contained in the dental apparatus during normal function. We further believe that the possessor of such a set of teeth, living on foods requiring thorough and vigorous mastication, necessitating full

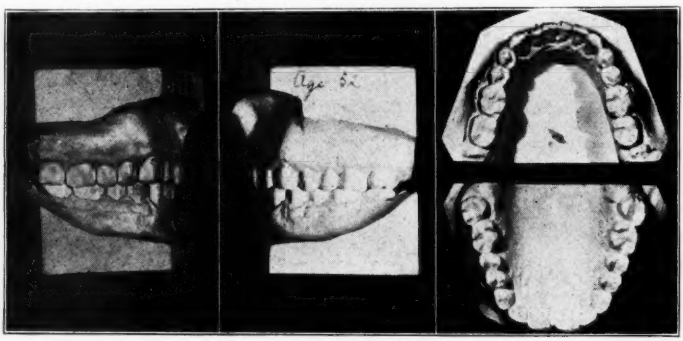

Fig. 7.—Left: Models showing normal relation of teeth that never had orthodontic treatment. The incisal overbite may be noted. Right: Occlusal view.

excursions of the mandible, will experience little or no disease of either the teeth or their investing tissues.

Fig. 8.—Left: View of model shown in Figure 7, with mandible swung to the left. Right: View with mandible swung to the right the same degree. The difference in the opening of the teeth on the right and left side when the mandible is in eccentric occlusion may be noted.

The foregoing does not imply that the teeth must be in ideal occlusion or 100 per cent perfect. Dr. Angle says:

> That no two normal human dentures have ever been created that were exactly alike it is reasonable to suppose, since it has never yet been demonstrated that Nature ever duplicates her forms. Three beautiful types or patterns of the teeth in normal occlusion are illustrated in Figs. 4, 5 and 6. [Fig. 1.] None is absolutely perfect. Probably Nature never makes the truly ideally perfect type in every particular. It will be seen that each of these dentures slightly differs from the others in position of the denture as a whole in its relation to the skull, in the angles of inclination of the incisors as well as of the other teeth, in the length of the cusps and consequent overbite of the incisors, in the sizes, widths and curves of the arches, as well as in the compensating curve of the plane of occlusion. Yet these variations are but natural and doubtless in perfect keeping with the distinctive

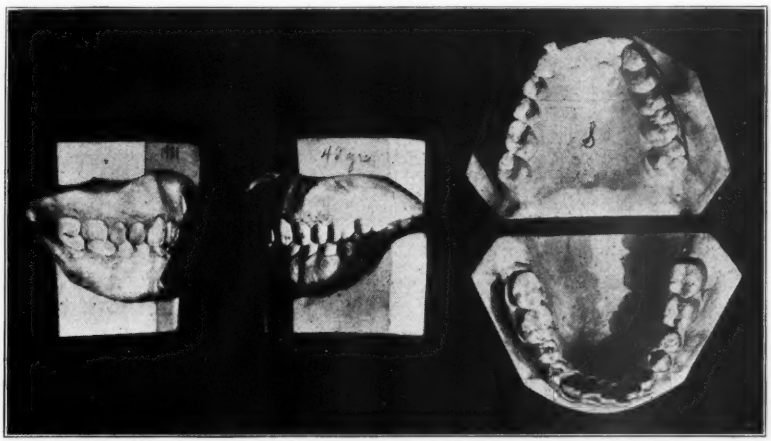

Fig. 9.—Left: Models of an extreme case of malocclusion. The mandibular left first molar is lost, and there is a tremendous incisal overbite. Right: Occlusal view.

individual type, and we insist that in the main the dentures are exactly alike in Nature's plan of the normal in human dentures. If all were alike in every particular it would necessitate that the three individuals represented by them also be essentially alike in every other particular.

From this quotation, you will understand what is meant by the term normal occlusion.

To the close observer, it will be evident that in few of the beautiful specimens of normal occlusion are all the teeth in balanced occlusion or in complete coordination when the mandible is

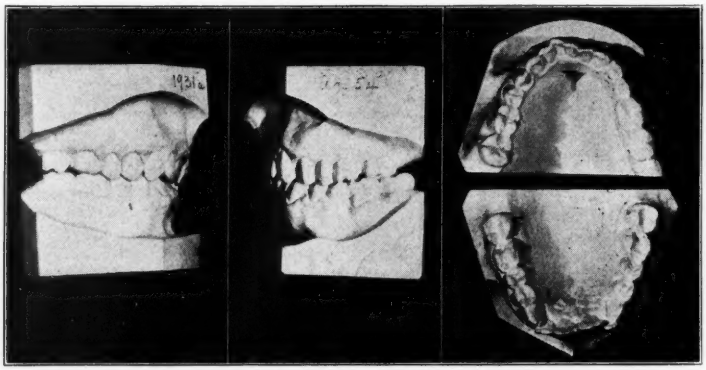

Fig. 10.—Left: Models of the case shown in Figure 9, made six years later. There had been a number of cast gold restorations made for this patient to open the bite, but, as will be observed, the incisal overbite is practically as great as in Figure 9, right. Right: Occlusal view.

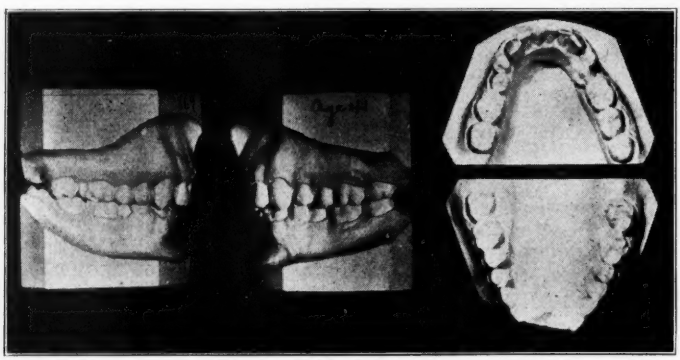

Fig. 11.—Left: Buccal views of models of a case of extreme malocclusion, in a man, aged 41. Right: Occlusal view. The condition of the investing tissue should be noted. The patient undoubtedly accommodated the movement of the mandible to the condition of malocclusion. If such had not been the case, there would certainly have been a tremendous disturbance of the investing tissues of the teeth.

in eccentric position. In fact, this will be found only in those cases in which the mandible has been vigorously used during development and subsequently, the balanced occlusion being in these cases produced by harmonious wear of the occlusal surfaces. We believe it quite possible for the human dental apparatus to develop in balanced occlusion and then, owing to a change in the food supply, become unbalanced or in such a relation that vigorous excursions of the mandible are accompanied with incisal or cuspal interference.

We are therefore convinced that it is impractical and inadvisable for an orthodontist to try to place all natural teeth in balanced occlusion, and that it is unnecessary. We must not lose sight of the fact that civilized human beings generally live on foods that do not require thorough and vigorous excursions of the mandible in mastication.

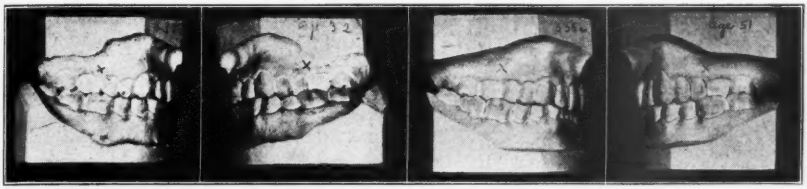

Fig. 12.—Left: Models of the case of a man, aged 32. The maxillary first molar and mandibular left central incisor had been removed years before. There is a tremendous incisal overbite with the upper second molars lingual to the lower molars. Right: Models of the case, nineteen years later. There is a very little more recession of the gingival tissues than in the views to the left; in fact, not more than might be expected in normal occluded cases.

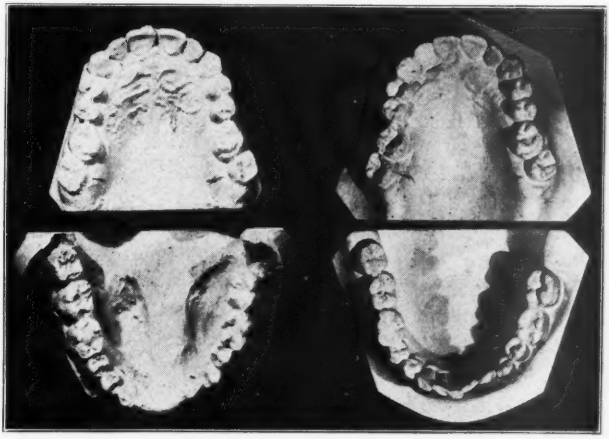

Fig. 13.—Occlusal views of the cases shown in Figure 12.

In full denture prosthesis, it is quite

a different matter, for then the teeth are securely fixed to their base and cannot give under stress as do the natural units of the dental apparatus. Any cuspal or incisal interference in such cases must tend to shift the bases to which the artificial teeth are attached, resulting in more or less movement of these bases on the underlying tissues. We are firmly convinced that full dentures should be in balanced occlusion, and also believe it practical to so arrange them.

It is not our intention to imply that teeth in such relation that trauma is

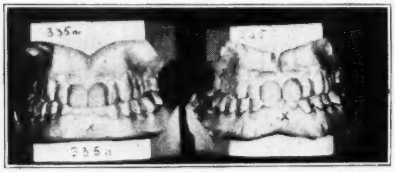

Fig. 14.—Anterior views of the case shown in Figures 12 and 13, the model to the left having been made nineteen years after the one to the right. Here again the patient has accommodated the movement of the mandible to the condition of malocclusion.

induced in normal use should be allowed to remain in that relation. We believe it is of the utmost importance to relieve such conditions, but, in doing this, it should be clear in the mind of the operator just how far he should go and how much he should grind or, better, how little he can grind and be able to relieve the interference. The best guide for this is a careful consideration as to just how the mandible is used in normal function in each individual.

It may be shown by slides made from models of cases with extreme lack of coordination that teeth in such a relation are not necessarily lost, nor do their investing tissues invariably become diseased, as often happens in cases with far less lack of coordination. These are shown with the hope that you will be led to pause before taking extreme measures in such cases and also to convince you that there are other factors besides

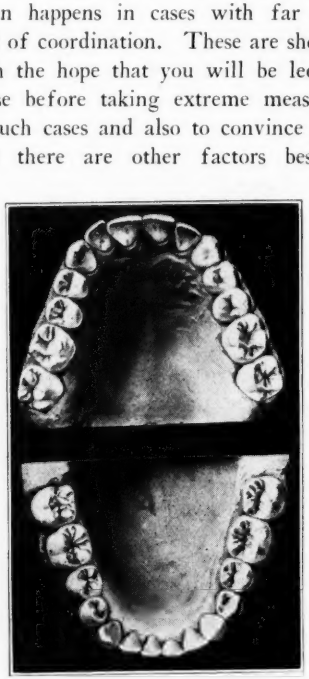

Fig. 15.—Occlusal view of plaster casts of a set of teeth in which no caries has developed. The mesial and distal marginal ridges of the bicuspids and molars should be noted.

lack of proper coordination to be considered in treating cases with disease of the investing tissues of the teeth.

Careful examination of the occlusal surfaces of the bicuspids and molars will reveal beautiful mesial and distal marginal ridges, running buccolingually, that Nature has provided to prevent fibrous foods being forced between the teeth.

When teeth are in normal occlusion,

these ridges serve to cut these foods during mastication, and any small particles that may be forced past the contact points will be deflected by the normal interproximal tissues. Failure to reproduce these ridges in fillings and inlays is responsible for much of the disturbance to these interproximal tissues, regardless of how accurately the contact points have been restored. In fact, we believe it good practice, in making such restorations, that these marginal ridges be accentuated, not, however, by having them too high, but by making the sulci slightly deeper than normal. If they are made too high, they will soon be battered down by the opposing teeth during mastication, or else will produce trauma. Impaction of fibrous foods between the teeth is always associated with disturbance to the interproximal tissues, and, where prolonged, is usually associated with deep pockets that are difficult to cleanse.

Notwithstanding all that may be said regarding the possibility of maintaining health in the absence of physiologic occlusion, whether accomplished through the medium of correct marginal ridges and normal contact points, or through high tissue resistance, it should be obvious that the greatest safety for our patients lies in providing for them that harmony of occlusal relation that is implied in the term physiologic occlusion.

The application of these ideas to the work in which the members of this section are interested is one that will interest the orthodontist and periodontist alike. Here, especially, we see the possibility, in many cases, of establishing physiologic occlusion through the restorative operations that may be performed, but, as I have already stated, it is not feasible nor necessary that the natural teeth be in balanced occlusion.

18 West 74th Street.

DISCUSSION

Spencer R. Atkinson, Pasadena, Calif.: For many years after it was brought out by Dr. Angle, the term "normal occlusion," and the explanation of the term, especially as set forth in the seventh edition of his book, was deemed by orthodontists and, generally, by biologists, physicians and dentists, as of sufficient breadth to cover the condition of normal sizes, patterns, positions, relations and inclinations of the teeth of individuals of the human species and to include such other normal conditions of structure and function as relate to and depend on this condition of the teeth. Within the last few years, there has been observable in certain quarters a tendency to confuse Dr. Angle's clear definition and discussion of normal occlusion, to minimize, to misinterpret and even to deny it. Notwithstanding all that has been written, the normal occlusion defined and described by Dr. Angle is still normal occlusion and always will be, and instead of becoming less true and less of an ideal, and an entirely practical ideal, for orthodontists to work to, wider study and increased knowledge reveal that it is, if possible, truer and more completely the basis of true orthodontia than when he first brought it out. And when I say normal occlusion I mean normal occlusion. I do not mean any lower or any different ideal with which ignorance or incompetence or error may seek to fortify, to excuse or to justify itself. With Dr. Young, I have little quarrel. It is somewhat surprising that he should not recognize the authorship of the definition of occlusion which he ascribes to Anthony's Dental Dictionary, familiar as he otherwise seems to be with the chapter on occlusion in Dr. Angle's seventh edition. I am confused by the terms "physiologic occlusion," and "balanced occlusion," as I believe Dr. Young is. I cannot conceive of two ideals in occlusion or in anything else, nor can I conceive of any need for two. I cannot conceive of trying to treat cases of maloc-

clusion with one of two ideals, one an "ideal" ideal and the other a "practical" ideal. Nature doesn't work that way—she has no necessity for it. When she develops teeth in dental arches, unless her normal processes are thwarted, the result is normal occlusion. If the processes are thwarted, the result is a varying degree of malocclusion. If, in treatment, we do not so change the abnormalities that the forces of occlusion are balanced and thereafter operate harmoniously, instead of normal occlusion we will only achieve a malocclusion, not an "individual normal" or a "balanced" occlusion, or even a "physiologic" occlusion, whatever the latter term may mean. Now, in order that we may all refresh our minds with regard to normal occlusion; that we may see that it is Nature's plan for the arrangement of teeth throughout the animal kingdom; that we may see the reason for it, and that we may see how, to what extent and why the types of these teeth harmonize, as they do so completely, with the skull, the face, and without doubt all the other parts of the individual, let us give our attention for a few moments to teeth from another angle. From the study of teeth and their relation to the other structures of the body, we find enamel, or "the business end of the teeth" to be the only tissue that, once formed, retains its shape regardless of circumstances; and that does not possess the power of modifying its form in order to meet changing conditions. We know that, in pattern, number and inclination, the roots of teeth have most intimate relation to their respective unchanging crowns; in fact, that they are as they are because their crowns are as they are. We know that, in their completeness—roots and crowns—teeth of given dentures harmonize in type not only with one another, but, normally, with all the other structures of the head; that individual type is nowhere more accurately manifested than in those parts which form the masticatory apparatus. Indeed, we know that the teeth, more than any other structures of the human body, are representative of, are the index to, the type of that body. It will be remembered that the forms, the patterns, the types of the crowns of the teeth are laid down very early (even before the muscles of the denture are developed) in plastic tissues; that the material of these tooth forms is not plastic, but is unyielding enamel, and hence the tooth forms are not in the least modified by the tissues and structures with which they come in contact during the development and eruption of the teeth. Furthermore, the tooth forms are laid down at different periods. Each is a separate and distinct unit, complete in itself, and yet, when growth processes are normal, after the whole series of teeth have taken their respective places in the dental arches, the occlusion, we say, is balanced, is normal; the matching and fitting, the harmonizing and interrelating of all the hundreds of inclined planes is perfect. They do not have to be worn or ground to fit perfectly, but fit within their intended anatomic relations just as soon as they take their normal positions. Now, under these conditions, when the jaws are tightly closed, as in deglutition, the roots of the teeth of the respective arches incline in definite directions in accordance with the type of the individual (as prognathous, mesognathous and orthognathous), these directions having been determined in each given case by the patterns laid down for the crowns of the teeth. Now, with the crowns of the teeth in normal positions and relations, i. e., normal occlusion; with the roots of the teeth on such angles of inclination as to maintain the crowns in normal occlusion; with the structure of the bones—maxillae and mandible—such as to maintain the roots at the correct angles of inclination, the bony framework over which the muscles operate is established—established, as must now be plainly perceived, in exact harmony with the patterns of the crowns of the teeth. It therefore follows that the related muscles that operate this bony framework and function over it and round out the facial contour must correspond in type or they could not function efficiently. When it is remembered that the forms of the crowns of the teeth are determined long before there is any "facial contour" and how and to what extent the face is dependent on these tooth forms for its ultimate contour, to call tooth forms or crown forms the index to individual type will not seem so far-fetched. Now, since the crowns and roots of teeth are the framework

on which the contour of the face depends; since no two teeth of the same side of an arch are identical in form, and since the patterns of the teeth are not subject to change, it is evident that for each tooth to occupy its proper place in the skull in three dimensions of space is most essential if the true type of given individuals is to be expressed. In other words, in expressing the type of an individual to the nth degree, or perfectly, there can be but one place or position for each crown and root of a tooth to occupy in its respective arches, and just to the extent to which each varies from its true position does it fail in performing its normal functions and does it depart from what Dr. Angle has described and called the line of occlusion. What is the function of a crown of a tooth? On what mechanical principles are the crowns of teeth designed? They are designed, first, to aid in obtaining food or in the getting of food into the mouth; second, for masticating or preparing the food for the stomach. On the occlusal surface of the human molars, there are many blades, as we have said. These can function fully and normally only when they are brought into the relations which Nature designed them to have with those of the molars of the opposing arch. And it is fully evident that only when the crowns of the teeth have, in their respective arches, taken the one and only position designed by Nature for each crown, and their roots have assumed the position and direction, or angle of inclination, angle of axial stress, designed for each, that all these series of blades will or can shear consecutively, positively and most efficiently, and be permanently maintained in such positions to continue to shear normally. And, if they do function accurately, positively and efficiently, the maximum cutting and grinding is accomplished most speedily and thoroughly with each excursion of the mandible. Furthermore, being in such perfect balance, they are not only most efficient in grinding, but most effective in maintaining their normality of occlusion. Under this condition, they will necessarily be in what we have already referred to as the line of occlusion. In a normal skull, the posterior part of the maxillary bones supports the molar teeth, which have multiple roots. The anterior part supports the smaller teeth, which have smaller and, for the most part, single roots. These two portions are divided by what anatomists call a strong ridge, but which we will call the key ridge. Immediately anterior to this key ridge is the canine fossa. In this skull, the true type of the individual represented by it is expressed because everything is normal and all the teeth are in their correct positions in the line of occlusion. The first permanent molar is directly under this key ridge, the position I think I may safely say it always occupies under normal conditions when the denture is fully developed. If the molar drifts forward and does not rotate, the mesiobuccal root will protrude through the process into the canine fossa. In a skull in which all the crowns of the teeth are apparently in correct occlusion, if you notice carefully you may see that the mesiobuccal root of the first permanent molar protrudes through the bony tissues and, the process being weakened, it moves excessively during mastication, causing also a like condition of the lower molar. It is plain that there has been a breaking down of the process and soft tissues and that double protrusion has taken place—a condition which fails to express the individual's true type; which is another way of saying that the forces of occlusion are out of balance. Normal function of this "mill" is therefore impossible, for the control of normal function—the balance of forces—has been lost and deterioration has already set in. Every damaged part of any denture of any tooth on which we operate must be accurately repaired, and every tooth root, as well as crown, placed in its correct position in the line of occlusion, which means in its correct relation to its fellows and to the skull. You may call it "balanced occlusion" or "physiologic occlusion" or "individual normal occlusion" or "practicable occlusion" or "efficient occlusion" or any other mischievous or misleading name you choose. But as there is only one correct position in the line of occlusion of each individual for each particular root and crown of each of his teeth, so for each particular root and crown of each of his teeth, there is only one possible occlusion that will express the type of that individual and that will remain permanent to

continue to express it, and that is normal occlusion.

Dr. Young: Dr. Atkinson is talking about the way the orthodontist the country over is referring to ideal occlusion. Nobody has ever found one, in skull, in human denture or in casts made from human denture. Normal occlusion, as we find it, falls short of the ideal.

James M. Prime, Omaha, Nebr.: When I read the title of Dr. Young's essay in the program I was suspicious that he was going to advocate the building of a continuous, high marginal ridge, which, I am sorry to say, is the custom of most operators over the country. They seem to think they are imitating Nature by building these high and often sharp marginal ridges, while, as a matter of fact, that is not the way Nature has made them at all. If asked why they make them so, they usually answer by saying they were taught in college to do so, or that they think the high ridges will keep the food out of the interdental space. Dr. Young advocates the close imitation of Nature in these restorations and I therefore have no reason to differ with him.

Edmund Noyes: I do not think that Dr. Atkinson was thinking about an ideal occlusion when he responded to Dr. Young's paper, for the reason that Dr. Angle himself says he never saw an ideal occlusion, and the reason is that he never saw an ideal man or woman in which to put an ideal occlusion. Normal occlusion is one that is fitted to the type of the individual, and if the individual were ideal, the normal occlusion would be; not otherwise.

Dr. Young: In replying to Dr. Prime, I wish to call attention to just one point, i. e., that I have advocated accentuating the mesial and distal marginal ridges when making inlays involving these areas in the bicuspid and molar teeth and I have also stated that, in doing this, the ridges should not be too high, but that the sulci should be slightly deeper than those found in the natural teeth. The nearer the restoration comes to the normal anatomic tooth form for the particular individual for which it is intended, the better service it will render.

Dr. Prime: We all misunderstood you, Dr. Young, when you said, "marginal inlays we don't want." We do want them, but we do want to imitate Nature as it should be imitated.

THE TEACHING OF PREVENTIVE DENTISTRY IN COLLEGES OF DENTISTRY*

By HAROLD J. LEONARD, B.A., D.D.S., Minneapolis, Minnesota

AT THE present time, a step is being taken in dental education, of most far-reaching significance, yet withal so quietly that the body of the profession is unaware of the change. I speak of the absorption of dental education into the universities. Since this will undoubtedly influence the group of subjects associated with what is commonly termed preventive dentistry more than the others, I want to speak of it particularly in this relation.

I shall try to show (1) what the organization of the preventive dentistry group of subjects should be; (2) what its status is at present from a teaching standpoint, and (3) what changes are necessary and undoubtedly will be made under the influence of university affiliation. By limiting my paper to these three topics, it will be possible to emphasize certain points that it would be impossible to emphasize were one to follow out the ramifications of this very large subject.

In a university, a distinction is made between a college or school and a department. A department is a unit in which one branch of science, arts or literature is taught. The college, on the other hand, is an organization leading its students by means of work in many departments to a certain educational end marked by a degree. We have the departments of physics, English or physiology, and the colleges of education or engineering. Just so, we have a department of dentistry and a college of dentistry. It is the department of dentistry we wish to analyze.

The department of dentistry as ordinarily organized has certain usual subdepartments or divisions. These are dental or oral anatomy, prosthetics, operative dentistry, crown and bridgework, oral surgery and orthodontia. With the exception of oral anatomy, which is science, these subjects are predominantly courses in technical training in the treatment or restoration of mouths and teeth mutilated by deformity or disease. None of them are taught from the standpoint of preventing disease except so far as prevention concerns permanence in the restoration. Nor should they be. These courses are not the place for the direct study of the causes of health or disease in the mouth and the prevention of disease. Such studies should fall in one or more separate but coordinate divisions of the department of dentistry, which we will call, for convenience, the division of oral hygiene and pathology, or, if you

*Read before the Section on Orthodontia and Periodontia at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

prefer, the division of preventive dentistry and oral pathology.

In this division or divisions should be included the scientific matter dealing with oral health and disease and such technic for its detection and treatment as is not included already in the work of other divisions. Thus are included subjects ordinarily called oral hygiene, oral pathology, oral diagnosis, therapeutics, prophylaxis, periodontia and preventive dentistry. Of these, oral hygiene and oral pathology are pure sciences; while oral diagnosis, therapeutics, prophylaxis and periodontia involve considerable technical training as well. These subjects are all bound closely together and form a natural subject group, for several reasons. In the first place, they are closely related to each other from the standpoint of cause and effect; in the second place, none of them is so closely related to any of the other subject divisions as to this; and, in the third place, they all call for the same type of teacher. The teacher of this group is one whose interest lies along scientific or sociologic lines rather than mechanical or artistic. It is a grave mistake to get subject matter mixed so that, for instance, the teachers interested in operative dentistry procedures are obliged also to teach the technic of dental prophylaxis. Their interest does not lie in this direction, and the teaching suffers for it. The material for these courses gives the application in dentistry of the facts of the fundamental and medical sciences. It therefore requires teachers trained in these sciences, as most of the other courses in dentistry do not.

Since the terms oral hygiene and preventive dentistry have come to be used very differently by different authors, it is necessary to define them at this point as they will be used in this paper. I have no hope that these definitions will be universally acceptable. I only hope that an additional stimulus may be given to some authoritative group dealing with nomenclature to settle the matter so that the terms may come to mean the same to everybody.

Oral hygiene is the science dealing with the laws of health of the mouth. It embraces the care of the mouth, of the body and of society as a whole, leading to the preservation and promotion of health of the mouth and, through the mouth, of the body as a whole. On the other hand, preventive dentistry is that part of dental practice by which science and art are applied to the prevention of disease and the preservation of health in the mouths of individuals and groups. Oral hygiene is a science. Preventive dentistry is the application of science.[1]

Dental students are taught the science and the methods of application. Work with patients and the public to promote better oral health conditions is preventive dentistry.

Preventive dentistry is involved in much of dental practice. All dental operations, if properly done, have prevention of future disease as a goal, fully as much as repair of present infirmities. Orthodontia is largely a preventive dentistry procedure. Prophylaxis is a preventive dentistry procedure pure and simple. Even periodontia is at least as much a matter of study and work to prevent future disease as it is treatment of present lesions. It does not seem well, therefore, to

1. From address by the author before the American Association of Dental Schools, March, 1925.

make preventive dentistry a separate course in the curriculum, but rather to cover it in the several subjects related to it which have a more definitely standardized subject matter; namely, oral hygiene, oral pathology, oral diagnosis, prophylaxis and periodontia.

There is a difficulty with the science of oral hygiene in that the facts relating to health and the causes of disease in the mouth have been very slightly worked out. These facts must necessarily be correlated from studies in the chemistry, physiology, pathology, bacteriology and histology of the oral tissues and body as a whole, as well as from the observations of clinical dentistry and clinical medicine. These researches are only in their beginnings. We do not know the cause of susceptibility to dental decay, or how to prevent it by physiologic means. We do not know the causes of irregularity of the teeth, or how to prevent them. We do not know the fundamental physiologic cause of dental periclasia, although we are better able to prevent it than the other two conditions; in other words, we are not yet able to teach oral hygiene in any adequate manner because we have not the facts to teach. The more profound our knowledge of all that is known about this subject, the greater the realization of its inadequacy. Much research that has been done has been so unscientific in method and conclusions as to be quite useless to the scientific student or teacher. Much of the evidence is conflicting. When one finally gathers the facts that seem definitely settled and proven, they are few indeed.

I feel that it is important that this point be brought home, not only here but to dental students as well. It is time that we awake to the truth that we have not the facts for the teaching of oral hygiene or for applying any effective system of preventive dentistry. One talks of cleaning the teeth; another of lime salts in the food; another of detergent or cleansing foods; another of excessive sugar and starch, and so on. All have vociferous advocates both to the profession and to the public. There is evidence for every theory, but there is also evidence against every one, and it is time the profession was made aware of the real situation. We are doing a lot of work in preventive dentistry, but much of it is wasted effort because we do not know what we are talking about. When we do get results in any given case, it is because we have broken the balance of forces working against the individual by eliminating one of the factors, not because we have found and eliminated all such factors. In many cases, elimination of one factor is not enough, and our preventive dentistry method, of whatever type, fails. We have a plethora of theorists, and far too few critical, quiet scientists getting at the facts. I suppose we need the enthusiasts to keep the profession interested and aroused to its responsibilities, but what we need right now more than anything else in dentistry are the quiet, painstaking researches in fundamental science as related to dental disease on which oral hygiene and a real system of preventive dentistry can be based.

For a number of years, it has become increasingly evident that, just as medicine has undertaken to eradicate the scourges of disease that afflict mankind

in other parts of the body, so dentistry has the task of eradicating the diseases of the mouth, dental caries, malocclusion and dental periclasia. Repair of the mouth after disease has occurred is no longer sufficient, any more than treating typhoid cases after they occur is sufficient in a typhoid epidemic. Reparative dentistry, essential as it is, must be secondary in any broad scheme of adequate modern dentistry. Our chief effort as a profession must lie in preventive measures. We have plenty of evidence that we can never catch up with the reparative work needing to be done. If more than a small fraction of the public is to be served, the efforts of dentistry must be directed to preventing dental disease before it starts. If preventive methods can be made adequate, then cases needing repair will be exceptional rather than practically universal, and the profession will be numerically sufficient to care for the needs.

We have, therefore, three fundamental propositions to deal with: 1. It has become the duty of dentistry to eradicate dental disease as an affliction to humanity. 2. Preventive dentistry is the primary duty of the profession, to which reparative dentistry must be secondary. 3. We have not now the facts on which to base an adequate system of preventive dentistry. With these propositions in mind, let us study the means of dealing with them in the dental college and dental department; for they are, after all, matters which must be settled by and in universities.

The present curriculum in the dental colleges, with few exceptions, lays little stress on preventive dentistry subjects. Oral hygiene is not even taught in some colleges. In others, it is of no value for the purpose as it is taught. In nearly all colleges, the correlation of fundamental science with clinical dentistry is very weak. Thus, what is of value in physiology and physiologic chemistry to the dental student is lost because the teachers in these subjects are not acquainted with the application of these subjects to dentistry and because the teachers of clinical dentistry are almost, if not entirely, ignorant in these sciences. Then, the tendency up to the present in the colleges is to prepare students to be able to pass state board examinations. These are conducted by practicing dentists and are almost all tests in dental technic with a minimum of examinations in the sciences. The result of this system is to make dental technic the sole objective of graduating dentists. The idea that reparative and surgical procedures are secondary in importance to the sciences involved in preventive dentistry is farthest from their thoughts.

The universities' first duty in dentistry must be to change their emphasis. This does not mean that time now necessarily devoted to teaching surgical and reparative dentistry must or can be greatly reduced. Undoubtedly, some cuts are made possible by improved teaching methods, as is shown in colleges where they are already in effect. But it does mean a greatly increased emphasis on, and improved teaching in preventive dentistry subjects. It means a dovetailing of these subjects into the whole curriculum so that the first thought and aim of students and graduates is prevention of dental disease.

The means for bringing about this change of emphasis in dental education will vary in different universities. A few methods can be suggested: 1. The foundation education in basic social science and natural science must be adequate. The students must have a definite knowledge of man in relation to his environment and a mind trained to appreciate broadly the needs of man. 2. The sciences concerned with the workings of the human body must, in many respects, be as familiar to the dental student and dentist as they are to the medical student and practitioner. An accurate knowledge of physiology and physiologic chemistry is not necessary in order to learn to fill teeth well, but it is necessary if one is to do anything in the more important work of preventing dental caries. The medical science subjects should be taught by teachers who have become thoroughly familiarized with the application of dentistry. It is possible, by cooperation between the teachers in the sciences and those in dentistry, to work this out so that the subjects become as vital to the dental student as they are to the medical. 3. The dental departmental division dealing especially with preventive dentistry subjects must be developed until the courses given and their arrangement in the curriculum are such that they are adequate to give the proper emphasis in the college course as well as to give the necessary knowledge and training. It is of course at this point that the universities and their dental departments will have the most difficulty, for not only is the research necessary for teaching these subjects not carried out, but teachers prepared in such knowledge as there is or trained in the correlated fundamental and medical sciences are, with few exceptions, simply not available at the present time.

In order, therefore, for the universities to cope with this situation, it will be necessary to train teachers for this work. This will involve what is a new departure in dental departments; namely, giving time to teachers on a full-time pay basis for study toward an advanced degree. The teacher in the science of oral hygiene should have a graduate degree of doctor of philosophy in some subject, such as physiology, physiologic chemistry, bacteriology, histology or sociology. The Ph.D. degree, from a good university, means that the recipient has been trained in an unusual degree in the methods of scientific scholarship. He becomes accustomed to distinguishing between facts and theories and to carrying any study to its basic facts. He has learned the methods of constructive research and should be able to direct such research on the part of others. The time has come when departments of dentistry must be manned with teachers many of whom have this training. Other departments of universities have recognized this for a long time, and there are few departments in science in the better universities that are not manned for the most part by men who have advanced degrees.

When the universities have the staff trained in this way for teaching the sciences associated with preventive dentistry, the matter of facts to teach will gradually resolve itself. With every dental department doing its part in studying the facts relating to physiol-

ogy, chemistry and other sciences pertaining to dental health and disease, through both the researches of the staff and those of advanced students, it will not be long before the necessary but elusive facts will be obtained.

When research work is in progress in the schools, even the undergraduates will come in contact with it. Many of them will be imbued with its spirit and will continue until they, in turn, are trained for university work. It will do more than anything else toward giving that emphasis to the preventive aspect of dentistry which is so notably lacking in the schools. It will bring dentistry abreast of the other professions, especially medicine, in intellectual attainment and in disinterested service for mankind. Thus it is that the universities by training teachers in preventive dentistry subjects and establishing researches in this field are going to make it possible for dentistry more nearly to fulfil her real public service, that of eradicating dental disease.

The universities must be the place for research to be cultivated. It is in them that the leaders in science and thought are found. They have the facilities, the associations, the libraries, the traditions, and all that favors quiet, painstaking, scholarly investigation. There, neither the scholar nor his work is exploited for advertising purposes, nor is he hurried into unscientific conclusions, as seems inevitably the case with researches conducted under most other auspices.

In fact, the universities must from now on direct dental education as they do that in other lines. It is inevitable that the direction of educational policies must fall into the hands of those making these policies a life study. The university faculties are composed of such people. As long as dental education was an independent commercial proposition with no supervision or regulation other than that exercised by the dental societies through the enactment of legislation and through their state boards and the dental educational council, it was imperative for the societies to exercise that control. But the time has come when the universities have taken over dental education, at least in name, and no doubt it will shortly be in fact. From now on, we may look for university methods to apply to dental education. A study of dental education by disinterested scholars will inevitably bring about a greater emphasis on methods of preventive dentistry. It is certain that the shift to the universities will greatly benefit those branches of dental education relating to its preventive aspects.

There remains but to outline briefly the place in the curriculum of the preventive dentistry subject group. There are, in the average college, five-year courses, about 3,200 hours devoted to subjects in the department of dentistry. Of these, usually about 200 are devoted to oral anatomy, 800 to prosthetics, 950 to operative dentistry, 600 to crown and bridgework, 150 to oral surgery and 200 to orthodontia. From 100 to 200 hours only are given to oral hygiene, oral pathology, oral diagnosis, therapeutics, prophylaxis and periodontia. A number of teachers from the various schools in the latter group have cooperated in the last two years and made something of a study of this matter,

and it is generally conceded that considerably more time must be given these subjects if they are to receive their proper balance in the curriculum. In the first place, they should appear early in the dental course and should continue throughout the course as a graded sequence. A brief course in personal oral hygiene might well appear as an elective for predental students in the predental years. In the first dental year, some work in the prosthetics technic course might well be devoted to a study of traumatic occlusion, using the Towner method of the University of Tennessee. Manikin prophylaxis technic should be a part of the course in operative technic.

In the junior year, oral hygiene should take at least thirty-six hours, and more as the subject is developed. A laboratory course in oral physiology and chemistry would be of great value as an adjunct to the didactic material in oral hygiene. In this course would be covered the facts known about the causes of dental caries, dental periclasia and malocclusion and the means of prevention both for the individual and for the community. Oral pathology and therapeutics would also come in the junior year, and this also should be developed as a laboratory course, and should require at least forty-four hours and more if laboratory work is included. Oral diagnosis will require at least eleven to sixteen hours of lectures and sixty-six to seventy-two clinical hours. Periodontia requires at least eleven to sixteen didactic and sixty-six to seventy-two clinical hours, and prophylaxis, a contributory subject, ninety-six to ninety-nine clinical hours. This makes a total of 300 to 345 hours besides the bits in the predental year and in the technic courses. This is less than one-ninth of the total time available for the department of dentistry. Viewed in this light and considering its importance, even this amount of time seems too small, but if rightly used it should prove adequate for the proper emphasis as well as educational requirements.

I look forward to the time, in a very few years, when every dental college will be an integral part of a university, when dental educational needs will be as carefully fostered as those of medicine, when dental faculties will be made up of highly trained men imbued with the spirit of research and infecting their students with that spirit, when we will know how one may live so as to avoid dental caries, dental periclasia and malocclusion, and the majority of dental students that graduate will go out filled with zeal to put this knowledge into effect with their patients, in the schools and in the community.

305 Dentistry Bldg., University of Minnesota.

DISCUSSION

R. W. Bunting, Ann Arbor, Mich.: This paper deals with certain problems in dental education and is therefore of special interest to teachers in dental schools and colleges. It should be of interest to every practitioner of dentistry in so far as he is concerned in the development of his profession and the newer phases of dental knowledge and experience. Dr. Leonard alludes to the fact that we are limited in the teaching of preventive dentistry by the fact that we know so little and that we are so uncertain concerning the methods of preventing dental disease. The picture which he has painted is true in a sense, but I am sure that it is not intended to convey the impression that at the present time we have no measures to suggest that are of practical

value in the prevention of disease. It is true that we have no vaccine for dental caries, nor any specific antitoxin for pyorrhea by which we may control these two important dental diseases in the way medicine has been able to control smallpox and diphtheria. We do have, however, certain definite knowledge concerning the origin and nature of these diseases, and we have at hand certain measures of partial control which we may teach and practice with full assurance of their value. In this connection, our position is not unlike that of our medical confréres, who, for so long a time, have sought for a specific protective measure against tuberculosis. They, as yet, have not discovered any specific serum or vaccine which is positive in its control of this dread disease. However, they have been able to control the ravages of phthisis, to prevent its occurrence and to effect a potential cure in a large number of cases by building up the resistance of the patient and improving his living conditions. Thus, they have accomplished a great deal in the prevention of this disease by the practice of indirect measures of partial control. So also we, in the prevention of caries and pyorrhea, know that the improvement of general health, nutrition, oral hygiene conditions and normal physiologic functions, exercises a most definite deterrent action on the inception of these two diseases, and these measures of partial control we may teach and practice with a firm assurance of their value and practicability. It is true, as Dr. Leonard has pointed out, that a too small part of the total amount of teaching hours of the dental curriculum is devoted to the subject of preventive dentistry. Unquestionably, the present ratio between the attention given to preventive and that given to reparative dentistry should be changed, but such changes cannot come immediately or swiftly, for, at the present time, there is vastly more information at hand concerning the repair of dental diseases than concerning their prevention. Consequently, dentistry is essentially a practical profession, the major activities of which must for a long time be confined to temporarizing with the mutilations incident to dental disease. In this regard, we also find ourselves in a position similar to that of medicine, in which, in spite of the great strides that have been made toward the prevention of general diseases, the major part still consists of the treating of diseases rather than their prevention. We are told that, in China, physicians are employed to keep their patients well and that there preventive medicine is the first aim; but we can scarcely say that oriental medicine is, for that reason, superior to that of the occident. As our knowledge of preventive measures grows, and as we become more and more convinced of the efficacy of such measures, there will be an increasing appreciation among dental teachers and practitioners of the part which prevention should play in education and practice. This has been made evident by the rapid strides that have come in this particular field during the past ten years.

I am sure that we all find ourselves in hearty accord with Dr. Leonard when he says that the great need of dentistry today is for a more earnest study of the exact nature of our most common dental diseases and the means by which they may be prevented. This is the greatest obligation that now stands before organized dentistry. At the same time we must teach and practice to the extent of our ability all the measures that we now have at hand, which are of practical value in the prevention of dental disease.

R. S. Vinsant, Memphis, Tenn.: Prevention in dentistry is of fairly recent origin. The dentists of a few years ago put all of their time on restorative dentistry. Medicine has advanced much farther in preventing many of the diseases of the human body. This is probably due to its being a much older profession and to the fact that the contagious and infectious diseases coming under the physician's care killed much more quickly and spread much more rapidly. Most of the dental diseases give little or no warning. It has taken years to pass from purely mechanical dentistry to the dentistry we now practice. It will take many more years to put dentistry on a scientific prevention basis. The older dentists thought that if they filled the tooth, they had performed all the obligation they owed to the patient. We are not very far from the same condition now. Dentistry has been, and is being, neglected as a health problem. The physician did not recognize the importance of dentistry in the great health program until recently. The leading physicians of our country now are beginning to appreciate the real value of oral health service. In many sections, physicians and

dentists are underestimating the value of teeth. They are not sure of their diagnosis; they extract and have extracted too many teeth that are very useful. The first dental school organized in this country, as you all know, was an outcast from the medical profession. It was unfortunate for dentistry that it could not be organized on a more scientific basis, but it was fortunate that the founders of this school held out with such bull-dog tenacity when they had been turned down by the medical profession. It was fine that these pioneers were able to see the importance of the oral cavity in the scheme of things. In the last decade, dentistry has gone forward by leaps and bounds, and it is only within this period that prevention has become the practice of a few of our leading dentists. I agree with Dr. Leonard that little is known concerning many of our problems. I also agree with him that this is due to a lack of proper training of the dentists. But how are we going to build a superstructure on a foundation for a building of one story? It can't be done. I don't know whether Dr. Leonard intended to do it or not, but he has made one of the greatest arguments for more scientific predental training. Without the training in the fundamental sciences, we cannot advance. There are comparatively few of our dentists who have had more than a high school education as a preliminary training. Our training for research and investigation is so meager that we do not recognize the facts when we have discovered them. We cannot expect to advance until we have more training in the fundamental basic sciences. The suggestion of Dr. Leonard as to how we shall train our future teachers in dentistry is a splendid one. The university with which I am connected decided, two years ago, that the number of the scientificially trained teachers needed for dentistry were not to be had, and that we must educate men for these positions. We adopted the plan outlined by Dr. Leonard, and many of the men on our faculty now are employed full time, with time given for advanced study in the fundamental subjects of health (such as bacteriology, pathology, chemistry, physiology and anatomy). I believe not only that every teacher of technic should know the methods of obtaining permanent results in restoration of lost organs of the oral cavity, but also that he should know the systemic results of poor dentistry, so that he may properly impress this on the students under his care. The dental schools of the past, as Dr. Leonard suggests, have been under the influence, more or less, of faculties whose chief object was practicing dentistry, and the secondary consideration was the making of money, directly or indirectly, from their association with a dental school. I think these men have given wonderful service. They have carried the load when the universities and the public were not willing to shoulder the responsibility. They gave of their time and substance. The work they have done should not be underrated, in the light of our present facilities. But the time has come when, if dentistry is to stand the test, it must be placed on the same foundation as the other sciences. We must have men who are interested in dentistry for dentistry's sake; men who are willing to put their life into the teaching of dentistry, without money consideration being the prime object. Do not understand me to mean that the teacher must not be paid for his services. As you know, the teachers of the past and present in dentistry and in all of the other branches of the sciences and arts are very much underpaid as compared with people in various lines of business. That will be true for some time; but in the meantime we must have teachers, and they must take up the profession of teaching in spite of the fact that they can make more money by practicing dentistry. Dr. Leonard's paper stated that most preventive dentistry now being practiced consists in the different operative and prosthetic procedures (in that there would not be a recurrence of the diseased condition). If the practitioner in America today would try to make his restorations in such manner that he would not initiate but would prevent a recurrence of the disease, we would feel much better over our prevention program. We must solve this problem through the dental schools. It has been neglected in the past. Too many men have been trained without a conscience; too many are practicing without recognizing their responsibility; too many are ignorant of their obligation to society, and the dental schools are, in a great measure, responsible. However, the whole responsibility cannot be laid on the schools. I believe that you will agree with me that infectious diseases of the oral cavity and the loss of many teeth and

other organs of the oral cavity have been caused by, and are being caused by, men professing to practice dentistry. Then it must be true that the dental schools are not able to get across the preventive measures which they already have at their command. What is the remedy? I believe, in this case, that it lies in calling the student's attention to the results that may follow from faulty restorations, and to his opportunity to lengthen or shorten the patient's life; as well as in continually preaching good technic. For example, in the science of dental anatomy, a flat contact point or a misplaced contact point may mean the slow eradication of the tooth, with its attendant systemic ills. Most of our dental schools are teaching correct technic, and they think they are through with their obligation when they have given the *modus operandi* for this technic. If, in the different subjects of the dental course, more attention is called to the local systemic results of poor dentistry and poor technic, we would have fewer advertising dentists and quacks, and more healthy people. I believe the presence of most of our advertising dentists today and most of the poor dentistry that is done by the profession may be laid at the door of the dental schools where these men received their training. A lack of stress on the moral obligation which a dentist owes to his patient has brought this about. I believe that much real good for preventive dentistry can come from a careful training of the embryo dentist in his obligation to society. In looking over the different dental schools for the last few years (and I believe that I have visited three-fourths of them), it has seemed to me that one of the great difficulties lies in the application of the principle of preventive dentistry, in a practical way, before the dental students. Patients from 6 years up come into our infirmaries, and we can do little for them other than curative dentistry. We must apply our present knowledge of oral hygiene by preventive measures, in our school infirmaries, so far as it is practical to do so. A dental clinic for the newly born babe must be added, and a progressive series of preventive measures applied, until the child has all the teeth in the second dental arch. In the University of Tennessee, we felt this need so strongly that this year, through the cooperation of the outpatient department of our health unit, we are planning a clinic beginning with the new born babe and continuing through the age of second dentition. This clinic will be carried on in cooperation with the pediatric staff of our medical school. The visiting nurses, of which we have quite a number, will see that these children are brought to our clinic periodically. We believe that this will be a step forward in applying the principles of prevention in such a way that the dental student may apply his knowledge gained in a more practical way after he is out in the profession. If the points stressed in Dr. Leonard's paper are taken seriously by the schools and the profession, much will be done for our preventive program.

A. W. Bryan, Iowa City, Iowa: One of the greatest benefits to be derived from the arrangement as foreseen by Dr. Leonard is the education of the entire student body of the universities, and indirectly that means benefit to the entire population of the country; for it is through the graduates of universities that knowledge of this kind is brought to the populace. The dental departments, working in cooperation with the universities, will make it possible for oral hygiene to be taught to every student, thereby giving those students who are going out as school teachers, social service workers and public health workers a better knowledge of the care of the mouth, so that, in their contact with people, this knowledge may be disseminated. At the same time, the predental student will be getting his instruction in personal oral hygiene along with his course in general hygiene, and in this way he will probably have a better view point of dentistry when he enters the freshman year than he would have without it. I disagree with Dr. Leonard in this one point: the course should not be elective with the predental student. Practically all dental students come to the first dental year with their vision of dentistry purely restorative. They are thinking of crowns, bridges, fillings—restoring that which has been lost through the ravages of disease; and it is difficult to interest them in dentistry from any other point of view. If this statement is doubted, let any teacher offer a course in oral hygiene during the freshman year, making it elective. His doubts will all be dispelled after registration for the course is completed. But with a required course in this subject early in the

student's work, interest is aroused and thought along the lines of prevention is stimulated so that, when he reaches the infirmary for practical work, he has a different idea of his chosen profession than that of merely restoring lost tissues and organs. In reference to the laying of so much stress on technical subjects to the exclusion of the sciences—both from the standpoint of the teachers of these subjects and the state boards: this balance of emphasis must be changed, and greater cooperation be exercised by the several departments in the dental college. Outstanding cooperation of the departments has an effect on the students, and emphasis on prevention by all departments impresses him with its importance. No doubt Dr. Leonard speaks the truth when he says that we know little as yet of the causes of oral diseases and means for their prevention. A vast amount of research work is necessary before we shall be able to show a decided advance in the control of dental diseases, and I agree with him when he says that the best and probably the proper place for this research work to be done is in the dental colleges, in cooperation with the universities, and by men who have had special training for it. But we must not overlook the fact that a great deal of work has already been done. Men have toiled at a sacrifice to themselves, under handicaps that were great, and for no personal gain or glorification; and much of this work has been discarded by a wave of the hand without being read, much less studied, by pseudoscientists, whose ridicule and sarcasm are only a cloak for ignorance. When jealousies and politics in our societies sneak out the back door, progress will come in the front way. I do not wish these statements to be interpreted to mean that we should accept anybody's findings without verification, but let us make use of the material available while we are getting under way for the wonderful program Dr. Leonard has outlined. I am sure many of the men who are trying to unearth some of this material without aid would welcome the shouldering of the load by the dental colleges and the universities. Dr. Leonard has indicated the necessity of a thorough understanding by the future dentist of the relation of a man to his environment and the mechanisms of life. This suggestion is timely; for there seems to be a tendency on the part of some colleges to minimize the importance of the biologic subjects. If we are going to understand disease, if the dentists of the future are going to prevent disease, they must understand the normal processes of health, and these subjects must receive more consideration than they have been given. There is a phase of the problem not here touched on directly that seems important. The cooperation that is going to be brought about by the close association of the dental college and the university will indirectly bring about closer union of the dental and the medical school. This is necessary, because there is a tendency at this time on the part of some medical departments to resent the fact that dentistry is becoming interested in biologic processes and the general health of dental patients. A feeling exists that a dentist has no right to know the state of the patient's blood, its morphology and chemistry, or even the diet that his patient is receiving. So I believe that this close cooperation of the dental school with the university and the close cooperation of the medical school with the university cannot help but bring about a better understanding between dentistry and medicine. Their goal is the same—the prevention of disease and the conservation of health. The figures given by Dr. Leonard as to hours devoted to various subjects are, I believe, representative of the average college. It is encouraging to know that most dental schools are gradually adding to the time used and the material given in the important subject of preventive dentistry and its allied work; and there is no doubt that more time should be placed on this work if dentistry expects to reach the goal set for it.

THE DISCOVERY OF ANESTHESIA

By EMORY A. BRYANT, D.D.S., LL.B., M.P.L., Charleston, South Carolina

AT the banquet given at the close of a meeting of the Southern Surgical Society, in Charleston, S. C., Dec. 11, 1924, and following a lecture given by him, Dr. J. W. Long, of Greensboro, N. C., made the following statement:

Though many previously had used ether in various forms, it was Dr. Crawford W. Long who discovered the scientific application of it as an anesthetic for surgical operations and thus revolutionized modern surgery within recent times.

That statement was challenged by me in the *Charleston Sunday News* of Dec. 14, 1924, and immediately thereafter, I began an investigation of all the literature and facts, relative to the issue, that had been published in this and other countries; the action of Congress, the files of the Patent Office, and such other sources of information as were available. Among the informative data collected was the following letter from Major General Ireland, Surgeon General of the U. S. A.

In reply refer to S. G. O. 730 (Anesthesia).

War Department
Office of the Surgeon General
Washington.

February 5, 1925

Lieut. Commander Emory A. Bryant, U.S.N.,
U. S. Naval Hospital,
Charleston, S. C.

My dear Commander Bryant:

I am in receipt of your letter of January 30th with reference to anesthesia.

In taking the query in your first paragraph; Samuel Guthrie had nothing to do with the introduction of anesthesia by chloroform or ether, but was one of the discoverers of chloroform, having obtained it by distilling alcohol with chlorinated lime in 1831, simultaneously with Soubeiram of Paris, who isolated it in the same year (1831). You will find Guthrie's articles about his discovery in the American Journal of Arts and Sciences, 1831, xxi, 64; xxii, 105. You will find biographies of Guthrie in Dr. Howard Kelly's "Cyclopaedia of American Medical Biography," 2nd Edition; in the Buffalo Medical Journal 1917, xii, 459; 502; and in the Medical Historical Bulletin, N. Y., 1920, 1, 4.

The controversy in regard to the priority of Morton or Long in the introduction of ether in surgical anesthesia has long since been settled in favor of Morton. It is true that Dr. Long used ether in surgical operations on the neck and elsewhere in 1842-3 and that this has been vouched for, but he did not publish his findings, and priority in medical as well as scientific is always determined by date of publication. The question has been pretty thoroughly thrashed out in extensive literature on the subject, and the general consensus of opinion is that expressed by Professor William H. Welch in his "Ether-day Address" that "We cannot assign to him (Long) any influence upon the historical development of our knowledge of surgical anesthesia or any share in its introduction to the world at large." The question came up recently in the selection of the name of Morton for a place in the Hall of Fame, and was decided, as ordinarily, in his favor. The feeling of physicians like Drs. Marion Sims, Hugh H. Young, and Gwathmey is simply that the man who first did a thing is entitled to the credit for it, but in science this credit turns, as stated, upon priority of publication and upon the effect which the individual exerted in the subsequent progress of science.

In regard to your other query, relating to

Dr. J. G. Dickinson, I regret that we have no information about him in our files. It is highly improbable that he published anything or that anything has been published about him, as our records in this respect are very complete.

Trusting that the above will be helpful, I am

Very sincerely yours,

M. W. IRELAND,
Major General.
The Surgeon General.

In my letter to the public press, I suggested the appointment, by their respective associations, of a committee, to be composed of three prominent surgeons of the medical profession and three from the dental profession, to consider all the evidence and decide this long standing controversy and place the honors where they belong by right.

The statue of Crawford W. Long, M.D., recently placed in the Hall of Fame in the Capitol at Washington, D. C., bears the following inscription:

GEORGIA'S TRIBUTE

CRAWFORD W. LONG, M.D.,

Discoverer of the use of sulphuric ether as an anaesthetic in surgery on March 30, 1842, at Jefferson, Jackson Co.,

GEORGIA, U.S.A.

There has never been any dispute or controversy as to the fact that Dr. Horace Wells of Hartford, Conn., was the first to practically apply nitrous oxid gas as an anesthetic for the extraction of teeth, in 1844, or that he used it for a time in his office for that purpose. Although he was successful to that extent, unfortunately he was unsuccessful in his demonstration before the Massachusetts General Hospital Staff and the students and physicians present, and was accused of being a fake and fraud by them, which so preyed on his mind that he soon had to give up the practice of dentistry and finally committed suicide. In view of later events of successful use by the dental profession, it is reasonable to suppose that his failure above referred to was due to the crude appliance used or to insufficient inhalation of the gas. From whatever cause nitrous oxid gas as an anesthetic was abandoned until revived in France by the chemist Colton, who had, at the suggestion of Dr. Wells, administered the gas to him and had drawn a tooth while Dr. Wells under its influence, thus practically informing himself as to its effects, and discovering its anesthetic properties.

There never has been any dispute or controversy over the fact that Dr. William T. G. Morton successfully demonstrated the use of sulphuric ether as an anesthetic in surgical operations, Oct. 16, 1846, at the Massachusetts General Hospital in Boston, Mass., and that a surgical operation was performed by J. C. Warren, M.D., on the patient anesthetized by Dr. Morton at that time, or that this successful demonstration was published to the world at large by Henry L. Bigelow, M.D., Nov. 18, 1846, or that Dr. Bigelow was present when the operation was performed, and therefore wrote from a personal knowledge of the result. These are absolutely undisputed facts throughout the world. They are accepted and noted by every writer on the subject of anesthesia in surgery, medicine and dentistry. They are accepted as historical facts by various authorities in the United States and Europe.

It is undisputed and of historical record that Henry L. Bigelow, M.D., obtained and took to England some sul-

phuric ether and introduced its use in that country successfully in December, 1846, and "when Europe confirmed the efficacy of ether, the opposition subsided," and it became the standard anesthetic in surgery throughout the world. This was what immediately followed Morton's successful demonstration of the use of sulphuric ether as an anesthetic, Oct. 16, 1846.

On March 30, 1926, a life size statue of Crawford W. Long, M.D., of Athens, Ga., was unveiled in Statuary Hall in the Capitol—as one of two citizens of the State of Georgia selected by that state to be placed in the National Hall of Fame under the general law governing this procedure.

The proceedings at the unveiling exercises are printed in full in the "Appendix" of the Congressional Record of April 23, 1926, pages 7988-7996, and the remarks of Senator William J. Harris of Georgia in the Senate of the United States at the time he introduced the Concurrent Resolution (S. No. 7) for the acceptance of the statue from the State of Georgia also appear on the latter page.

Senator Harris said in part, in his remarks above referred to:

> As Dr. Crawford W. Long, of Georgia, is now recognized by all competent investigators as the physician who first used an anesthetic in a surgical operation, my state has wisely named him as one of the two greatest citizens in her history, to be placed in Statuary Hall of the Capitol of our country. Realizing as I do the value of the physicians to their communities everywhere and believing that the discovery of the use of anesthesia in surgery has been of immeasurable advantage to the whole world, I am naturally proud that my state selected Dr. Crawford W. Long, the now unquestioned discoverer of the use of anesthetics in surgical operations, one of the greatest blessings that has come to the human race.
>
> This great achievement was accomplished by Crawford W. Long, who on March 30, 1842, in the town of Jefferson, Ga., removed a tumor from the back of the neck of James Venable, to whom ether was administered on a towel placed over the patient's nostrils. The tumor was removed without pain to the patient. Satisfactory evidence of this, the first surgical operation under an anesthetic, still exists. It is also established by the following facts: In 1849, W. F. G. Morton, a dentist of Boston, Mass., asked Congress for a grant of $100,000 to him as the discoverer of the use of anesthetics in surgery. This led to a bitter debate in Congress, in which friends of Dr. Charles T. Jackson, a well known physician of Boston, urged his claims to this honor, for he had used an anesthetic in a surgical operation in Boston on October 16, 1846, and the friends of a dentist, Horace Wells, of Hartford, Conn., urged that he had used an anesthetic in the painless extraction of teeth on December 11, 1844. It is to the credit of one of these claimants that he made a visit to Dr. Crawford W. Long, in Jefferson, Ga., in 1854, and investigated the facts. He was so thoroughly convinced of the priority of Dr. Crawford W. Long in the discovery of the anesthetic powers of ether that he publically withdrew his claims and presented facts that made it impossible for anyone else to be considered.

In the remarks made by Hugh H. Young, M.D., at the unveiling exercises will be found incorporated a copy of the letter of Charles T. Jackson, M.D. (first column, page 7993) of Boston, Mass., the physician to whom Senator Harris refers as "having publically withdrawn his claims."

Unfortunately, Senator Harris was mislead into two serious misstatements of facts in respect to Dr. Charles T. Jackson: First, it was not Dr. Jackson who "used an anesthetic in a surgical operation in Boston on October 16, 1846," but Dr. William T. G. Morton, a dentist. Second, Dr. Jackson did

not "publically withdraw his claims" in the letter referred to, neither did Dr. Jackson present "facts" therein "that made it impossible for anyone else to be considered," but the very opposite of that proposition.

Not only was Senator Harris mislead by Dr. Young but also many other prominent physicians and surgeons who have supported the claims of Dr. Crawford W. Long, Dr. Young having expunged that part of the letter of Dr. Jackson which was not in support of his desires and which is to be noted in the printed copy in the "Appendix" I have referred to.

Herewith is that part of the Jackson letter expunged:

> Of that I have no doubt. The only question is, was the ether thus charged to Mr. Venable employed by inhalation for the purpose of preventing pain and was it actually so used in the surgical operation charged at the time? The proofs of this must be in the statement of Dr. Long supported by the affidavit of the parties on whom the operations were performed or who witnessed them. These documents as above stated I have seen in the hands of Dr. Long, or rather copies of them, for the originals were sent to Dr. Paul F. Eve of Augusta, Ga., and were lost by him, so they did not appear in the Southern Medical Journal then published by that gentleman. On asking Dr. Long why he did not write to me or make known what he had done, he said when he saw my dates he did not suppose anything done after that would be considered of much importance, and that he was awakened to the importance[1] of asserting his claims to the first surgical use of ether in operations by learning that such claims were set up by others, and consequently wrote to the Georgia delegation in Congress stating the facts which Senator Dawson requested me to inquire into.

It will not only be seen that Dr. Jackson questioned Dr. Long's claims but left his own claims open for future action by him if the opportunity arose.

It may not be amiss at this point to state that the records show, and there appeared in the newspapers of the South in November, 1846, accounts of Dr. Morton's demonstration in the Massachusetts General Hospital, Boston, Mass., of the use of ether as an anesthetic in surgical operations, Oct. 16, 1846, and a patent (No. 4.848) was issued, Nov. 12, 1846, to Drs. Morton and Jackson, making public the details and methods of administering ether as well as the operations applicable to its use, which were published also by Henry L. Bigelow, M.D., in the *Boston Medical and Surgical Journal*, November, 1846, and that in December, 1846, Dr. Crawford W. Long received a copy thereof, and thus was made familiar, in 1846, as to "claims set up by others." It is at once apparent that his writing to the Georgia delegation in Congress, in 1854, was for other reasons than that disclosed by Dr. Charles T. Jackson, among which obviously might have been the tempting $100,000 for which Morton had applied to Congress to pay him for his patent and the use of his methods in the Army and Navy of the United States, its use then being general without any recompense or power to obtain it other than by sale.

Mr. Brand, of Georgia, spoke in the House of Representatives, Tuesday, March 30, 1926, as follows:

> Mr. Speaker, I rise to call the attention of the membership of the House to the fact that this afternoon at 3 o'clock in Statuary Hall will occur the ceremony of the unveiling of a life-size statue of Dr. Crawford W. Long, of the State of Georgia. The State of Georgia contends, and it is generally recognized throughout the world, that Dr. Long was the

1. "Idea" in original letter.

original discoverer of the use of ether as an anesthetic in surgery. He was born in Madison County, Ga., and thereafter for many years resided in Jackson County, in the same state in which county, March 30, 1842, he performed the first operation in which the use of ether was employed. He lived for many years and died in Athens, Clarke County, Ga., where I live. His two daughters, Mrs. Francis Taylor Long and Miss Emma Long, residents of Athens, will be present and will unveil the statue.

Doctor Long has done more, in my judgment, for the relief of the human race than any other person, living or dead, since the birth of Christ. A cordial invitation is extended to all members who can be present at the ceremonies.

Let us examine this last paragraph's statement by comparison. I herewith quote the original bill for services rendered to Mr. James Venable from which date these claims are made:

James Venable,
to Dr. C. W. Long, Dr.

1842		
Jan. 28	Sulphuric ether	$ .25
Mch. 30	Sulphuric ether and Exsecting tumor	2.00
May 13	Sul. ether	.25
June 6	Exsecting tumor	2.00
		$4.50

It must be remembered that all documentary evidence and the paper read before the Georgia Medical and Surgical Association in 1852 and his first published paper in the *Southern Medical and Surgical Journal*, December, 1849, are conclusive as to Dr. Long's administering ether to any person desiring the same and freely, in what was termed "Ether frolics," and as Venable states in his affidavit that he "frequently inhaled ether for its exhilarating effects," the bill demonstrates the fact beyond a reasonable doubt, that Dr. Long's fee for ether "for exhilarating effects" was 25 cents.

All of Dr. Long's claimed "experiments" were some four in number from March, 1842, to December, 1849, the date of his first paper. What happened to benefit the "human race" or compare with the birth of Christ of record so far as the world at large was concerned or anywhere outside his local town and county?

From 1842 to 1849, nothing appeared publicly. In 1849, he published an account of his experiments but no one ever heard of this publication or his work in anesthesia outside the State of Georgia. From 1850 to 1852, nothing illuminating or of public benefit was disclosed. In 1852, he published another paper, a summary merely of the former paper, and nothing new on the subject. In 1853, the world heard nothing of Dr. Long's discovery or of any great act of humanity or prevention of suffering and pain.

In 1854, Dr. Long appeared on the political horizon of Congress. He had an interview with Dr. Charles T. Jackson as a preliminary to the plunge, and, for the first time in his life he becomes a national character by having his name injected into a Senate bill (210) by Senator Dawson of Georgia, who stated on the floor of the Senate when he put in Long's name by an amendment on the floor of the Senate without its having been submitted to the Committees of Congress, who had been investigating such claims for three years before:

I regret that I failed this morning to bring some papers connected with the subject. I wish now to ask that further consideration of this bill be postponed until tomorrow, in order that I may produce those papers. I have in

my possession a letter from Dr. Jackson and one from Dr. Long of Athens, State of Georgia, on this subject. Dr. Long is a very young man, but he commenced his practice as early, I think, as the year 1843, and has, therefore, been over ten years in the profession. The evidence which I have will, I think, establish beyond controversy that this young man applied this discovery in the same form in which it is said to have been applied by one of the three individuals mentioned. I have forgotten his given name, or I would propose to insert it in its proper place.

MR. EVERETT: It is provided for by the general provision allowing all persons to come in.

MR. DAWSON: I know that, but I wish Dr. Long to stand among the four named in the bill as one of the individuals who, in all probability, made the first discovery. Perhaps it would be sufficient to put in "Dr. Long of Georgia."

And Dr. Long is quoted by his friends as saying: "My only wish about it is to be known as a benefactor of my race." And at his funeral great praise was given for this attribute, and at a meeting of physicians resolutions were passed that said in part: "Truly did he subordinate his desire for fortune and fame to the one great purpose of benefiting his race."

And Dr. Young, in his address at the unveiling states: "But a presentation of his (Long's) documents by Senator Dawson, of Georgia, promptly killed the bill to give Morton $100,000. (Dawson never presented any documents to Congress.)

And Dr. Young has this to say, further: "That the general usage of ether in surgery came after the surgeons of the Massachusetts General Hospital had operated on cases anesthetized by Morton, no one will gainsay."

We have seen what happened in all the years from 1842 to 1854, as benefiting the human race by the efforts of Dr. Crawford W. Long, and have summed up the results year by year.

Dr. Morton demonstrated successfully the use of ether in preventing pain in surgical operations, Oct. 16, 1846, and, within three months, ether was adopted as an anesthetic in both Europe and the United States and successfully used in surgical operations by following the methods of administering ether as given by Dr. Morton, and it has been the most generally used anesthetic throughout the world from that time to the present.

The bill (S.210-1854) passed the Senate by a vote of 24 to 13, April 19, 1854, and it came up in the House of Representatives, April 21, 1854, and was tabled with scant consideration because it provided a court method of designating the discoverer of practical anesthesia that would, in effect, supercede the patent laws of the United States; so it was this fact that defeated the bill by a vote of 82 to 46 in the House, and not anything brought before Congress by Dr. Crawford W. Long or his friends.

Mr. Morrell, in his speech for the adoption of the Resolution provided for the Hall of Fame in the Capitol at Washington, said in part: "The suffrages of no state will fail to be honestly and fairly bestowed, for no local shams will be intruded where the judgment of the world is sure to be challenged, and where partisanship loses its current value."

The dental profession has and will continue to challenge the claims of the friends of Dr. Crawford W. Long to such an honor.

Dr. Long, in his paper read in 1852,

admits his failure of title to such honors, thus:

> I know that I deferred the publication too long to receive any honor from the priority of the discovery, but having by the persuasion of friends presented my claims before the profession I prefer that its correctness be fully investigated before the medical society. Should the society say that the claim, though well founded, is forfeited by not being presented earlier, I will cheerfully respond: "So mote it be."

The Society passed the following resolution:

> *Resolved*, That this society is of the opinion that Dr. Crawford W. Long was the first person who used sulphuric ether as an anesthetic in operations, and as an act of justice to him individually and to the honor of the profession of our own state, we most earnestly recommend him to present at once his claims to priority in the use of this most important agent to the consideration of the American Medical Association at its next meeting.

Here we see Dr. Long defers to the society, and it in turn defers to the American Medical Association, and I am informed by the then chairman of the Long Unveiling Exercises held in the Capitol at Washington, March 30, 1926, that as far as he knew, the American Medical Association had never taken any action respecting Long's claims.

The only scientific body that has ever passed on the claims of Long, wherein the documents and evidence were presented for their examination, was the electors of the Hall of Fame of the University of New York, in 1915-1920, he receiving 11 and 4 votes respectively and Morton's name being "selected" for the honor by a vote of 72 out of a possible 100, while Long received 4 votes at the same time (1920).

The records show that outside of being designated by the Confederate Government then in Richmond to care for the families and men who remained at home in and around Athens, Ga., during the war between the states, 1860-1865, and that "he had a large country practice," Dr. Long never did anything in his lifetime of a national character or that would so designate him, let alone honor him. The question at once arises, what ground, fact or argument can the State of Georgia give for having selected Long for "National Commemoration in the Hall of Fame in the Capitol at Washington?" Was he a national character or was he merely what Mr. Morrell designated a "local sham?"

U. S. Naval Hospital.

AMALGAM: ITS WORKING PECULIARITIES AND ITS OPERATING DEMANDS*

By WILLIAM E. HARPER, D.D.S., Chicago, Illinois

I AM not unmindful of the fact that I may appear to handle the truth carelessly in some of the statements that I make and in some of the conclusions that I present, but as test experience has made me very positive and confident of the proof I offer, I ask for your severest criticism.

The need for a change in our amalgam technic could not be convincingly explained, and I have been compelled at every step to demonstrate the source of our failures and to prove by accurately measured test work the improvements that could be made by the use of a correct amalgam procedure. Seventeen years' experience with the air pressure test for adaptation in laboratory and clinic tests, made by representative amalgam operators throughout the United States, demonstrates conclusively that more than 90 per cent of our amalgam fillings leak as soon as exposed to air pressure from within. More than 40 per cent of these test fillings show defects large enough to be apparent to the naked eye. The fact that these leaks occur almost immediately is positive proof that these failures are the result of operative faults, not shrinkage and expansion.

In my clinical demonstrations of these facts during the past twelve years, I have presented a proved, practical and successful amalgam technic by which we may change an average of 90 per cent of failures or more to from 95 to 100 per cent of nonleaking fillings under 5 or more pounds of air pressure, with a much increased average for resistance to crushing stress and flow, of which the following experience is an indication. At these clinics, I have made 155 test fillings, only one of which leaked under 5 pounds pressure.

This extraordinary improvement in results that may be attained by the use a correct amalgam technic does not require extra time, nor does it call for the application of skill beyond the ability of the average operator. It simply demands that we understand its operative needs and correctly apply this knowledge.

The three most important details of amalgam procedure are the three most neglected, namely: the manner and time of mixing; the character of the plasticity; the packing force and the manner of applying it. Good amalgam work demands a high grade alloy; a

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properly prepared amalgam; a correct amalgam technic.

The use of a balanced high grade alloy does not guarantee a good amalgam. Dental alloys are manufactured for us. Amalgam we make for ourselves, and the strength and the stability of the hardened amalgam and the merit of the filling are only as good as the care and skill the dentist puts into it. I present the following as a necessary and complete order of procedure, every detail of which must be considered and applied to attain uniformly perfect results.

ORDER OF PROCEDURE

The order of procedure is as follows: cavity preparation; determining proper proportions; mixing; determining plasticity; tamping; orderly packing; stepping the cavity walls; attention to proximal form and finish, and to the matrix; pulp protection. I shall confine myself here to those details of procedure pertaining to the making of amalgam and its insertion into the cavity.

Proportions.—Proportions need not be exact, but the mercury should always be in perceptible excess. No risk is involved in starting the mix with mercury in excess, but many failures may result if the mix is made with a slight insufficiency of mercury.

Mixing (Amalgamation). — When high grade alloys are used, all dangerous shrinkage and expansion in the finished filling is a result of incomplete amalgamation. This movement may be controlled by complete mixing in the mortar.

Mixing in the mortar appears to consist of a solution and chemical reaction of mercury with the dental alloy, largely Ag3Sn, to form the compound Ag3Hg4, plus tin and excess mercury. Shrinkage occurs during the development of the solution and chemical reaction (mixing) followed by expansion as crystallization (setting) predominates. These movements always accompany and are the result of the physical changes that occur in the mixing and hardening of amalgam. .

If amalgamation is made sufficiently complete when mixing in the mortar, practically no movement can take place in the finished filling by diffusion. If we have no secondary amalgamation by diffusion, we have no secondary shrinkage and expansion in the finished filling. Copper amalgam fillings do not shrink nor expand, the thorough amalgamation by which process copper amalgam is manufactured being the probable explanation.

Mixing should be done by rapid rubbing, in a slightly dulled deep glass mortar, for a minimum time of two to three minutes; a small mix two minutes, a large mix three minutes. With approximately correct proportions and an accurately timed mix, we are assured a complete and adaptably plastic mix. Accurate timing is the only dependable guide for mixing, for which reason I suggest the use of an egg-timer.

Complete amalgamation is the first of the two operative procedures depended on to eliminate shrinkage and expansion in the finished filling.

Plasticity.—Insufficient plasticity has been the rock on which we have wrecked from 60 to 80 per cent of our

amalgam fillings. Quick setting amalgams do not afford sufficient time for thorough packing in proximocclusal cavities and large restorations unless the plastic stage is extended by mixing the amalgam extra plastic and retaining the excess mercury to be removed as the amalgam is packed into adaptation.

Medium setting amalgams provide abundant time without extra plasticity. But crepitus must always be avoided in all amalgams up to and during orderly packing except in small and simple cavities.

Workable plasticity and adaptable plasticity must be recognized as separate and distinct conditions. A workable plasticity develops in about one minute; adaptable plasticity requires a minimum time of two to three minutes, in mixing.

An ordinary mix of a quick setting alloy remains workably plastic from five to eight minutes; it remains adaptably plastic, two to three minutes only, and, in an average large or large proximoclusal cavity, from two to three minutes is insufficient time in which to apply a thorough packing technic. To increase this too short packing time, we mix quick setting alloys decidedly plastic, retaining the excess mercury until adaptation is secured; after which, it is readily removed by forcible and orderly packing.

We may build fillings to perfect form with a workable plasticity, but we must have adaptable plasticity to make a nonleaking filling. Adaptable plasticity (which means maximum plasticity consistent with the mass remaining workable) is the first and by far the most important operative procedure necessary to perfect adaptation. If this is neglected, all other procedures will fail.

Tamping.—Tamping, in its effect and purpose, is similar to jarring a plastic mass. Tamped amalgam retains its plasticity while we manipulate the amalgam into angles and against cavity walls, as a layer of uniform thickness free of all air voids. This accomplished, all that remains to be done is to compress it with an orderly applied force, sufficient to express the excess of mercury, and lock the amalgam into pressure contact with the cavity walls, at which moment the amalgam will immediately harden and set.

Condensation—A few amalgam operators pack amalgam with sufficient force to secure pressure contact, and a weak, leaking and unstable filling is the result. Amalgam fillings are made strong and stable through the operative details of complete amalgamation and forcible and orderly packing sufficient to remove the unattached tin and excess mercury.

A filling, to be uniformly perfect and strong, must be packed with force equally applied. This is best accomplished by orderly stepping the plugger from the center of the filling to the cavity walls. Packing done without order makes a filling weak and defective in spots, and develops many mercury pockets. Packing done by an orderly applied force condenses the filling equally, and the excess mercury is kept moving in one direction, outward, where it is at all times free to appear on the surface to be removed as it accumulates.

The most complete removal of tin and excess mercury by thorough, orderly

and forcible packing is the second and final operative procedure by which we eliminate shrinkage and expansion in the finished filling.

Orderly Packing.—Packing should be done with a medium or large plugger, used with all the force of the pen grasp, starting at the center of the filling, stepping a little less than its diameter in one direction in enlarging circles until the cavity walls are reached, and scraping off the excess mercury as it accumulates with the side of the plugger.

Orderly packing of each piece of amalgam added must be practically complete before crepitus appears. By orderly packing each piece of amalgam added, the last part is wedged between the first part condensed and the cavity walls. This important need is further provided for by stepping the cavity walls.

Stepping the Cavity Walls.—In building amalgam, we find the round or slightly oval pluggers the most generally applicable. In packing against cavity walls with such pluggers, we fail to compress small triangular areas between the steps. At such points, excess mercury will be pocketed and imperfections will occur. Forcibly stepping the cavity walls with a plugger small enough to penetrate to the depths of the uncondensed areas is absolutely necessary to remove the pocketed mercury to correct minute defects and again to wedge the amalgam into the tightest possible contact at this vulnerable point.

To step the cavity walls, we use small pluggers (1 mm. by 1.5 mm. in diameter), using all the force of the pen grasp. We start at one point of the margin or wall, step the plugger a little less than its long diameter in one direction once around the cavity walls, inclining the force toward the cavity walls. In carrying out this procedure, an extra thrust or two should be made in each point angle, in which locations defects would otherwise occur. As the filling approaches completion, the mercury may be forcibly expressed to the point where the mass still remains workable.

With a repetition of these operating details in each order of procedure, the cavity should be filled with a slight excess covering well all margins; after which, the filling should be thoroughly condensed to hasten the setting and cause the amalgam to remain as placed.

THE PURPOSE OF TIN IN AMALGAM AND ITS ATTENDANT DANGERS

My experimental and clinical test work leads me to the conclusion that tin alone is responsible for the flow observed in fillings made from high grade alloys. The remedy will be found in the use of an orderly packing of sufficient force to express most completely the unattached tin. This, if accomplished, will also remove the excess mercury and make pressure contact of the amalgam to cavity walls.

The more nearly the finished filling is made up entirely of the compound Ag_3Hg_4 and possibly a similar compound of copper and mercury, the stronger and more stable the filling will be. Tin in amalgam serves three purposes: (1) it facilitates amalgamation; (2) it lubricates the amalgam so that it moves on itself without drag when packing; (3) it retards the setting sufficiently to provide time for thorough

manipulation necessary to strength, adaptation and stability. After these purposes have been served, the more completely we remove it, the stronger and more stable the filling will be. Copper amalgam does not flow, probably because it contains no tin.

PACKING PRESSURES

One of the details of operative skill most difficult to acquire is sufficient packing power in the pen grasp, and I urge the necessity of practice to develop packing force.

During the past few months, I have been gathering from members of the profession a record of the pressure exerted in packing amalgam fillings. To date, I find about 40 per cent of operators pack with a force averaging under 7 pounds. This is insufficient to remove the dangerous unattached tin and excess mercury, and to develop pressure contact with cavity walls.

Nine to 15 pounds orderly applied packing pressure is required to remove dependably the tin and excess mercury, and secure adaptation. Many failures will result with packing pressures of from 7 to 9 pounds, and uniform failure will result when fillings are packed with less than 7 pounds.

The following demonstration visualizes clearly the need for pressure contact to make airtight adaptation.

Models for three-quarter crowns and gold inlays may be made by filling an impression with amalgam, and pressing it to place with the end of the finger in such manner as to permit escape of the excess of mercury, as the impression is jarred for five to ten seconds.

By these simple means, we shall never fail to make a model as nearly perfect as the impression. Notwithstanding the 100 per cent perfection of the model, a filling made in like manner will leak along all of its margins, because pressure contact cannot be made by this procedure.

AMALGAM PLUGGERS

A set of three contra-angled, smooth, flat-faced pluggers of the following size will be found best to meet all the needs in dental practice: One large plugger, 3 mm. in diameter; 1 medium plugger, 2 mm. in diameter; 1 small oval plugger 1 by 1.5 mm. in diameter.

6541 Yale Ave.

DISCUSSION

Hugh M. McElrath, Murray, Ky.: Dr. Harper's paper is a thought provoker. He has gone into the subject in a thorough-going way. As he has well said, the so-called, high-grade, balanced alloys are the result of the exhaustive investigation of G. V. Black, and, to my mind, there has been no important improvement in dental alloys since Dr. Black concluded his work. There are not a few alloys in the so-called, high-grade, balanced alloy class, made by reputable manufacturers that purport to be Black's formula. This in itself is misleading, if not deceptive, for Dr. Black had no fixed formula, the varying purity of the metals available governing the proportions. Again, Dr. Black steadfastly affirmed that 0.5 per cent zinc is inadvisable for the reason that the amalgam will continue to change bulk. Dr. Black insisted on a non-zinc alloy. His study of the behavior of amalgam was exhaustive and covered a longer period of time than any other up to that time, the National Bureau of Standards not excepted, yet the majority of the so-called, high-grade, balanced alloys have a zinc content above 0.5 per cent, so it would seem that the manufacturers have not profited as they should by Dr. Black's faithful research. The National Bureau of Standards is confident that there are many shrinking alloys advertised

and sold as high-grade alloys. I agree with Dr. Harper that the use of the best alloy available does not guarantee a good amalgam. A master artist was asked by a novice what he mixed his pigments with and he answered, "Brains." The making of uniformly good amalgam fillings requires as high, if not higher, skill than anything we are called on to do, and I rejoice that the subject is being agitated by such an authority as Dr. Harper. Let us hope that there will be a genuine revival of interest in alloys and amalgam that will result in the manufacture of uniformly better alloys and the making of better amalgam restorations by all who strive to improve. I should like to ask Dr. Harper whether the test fillings made by other skilled operators and that fail immediately to resist air pressure continue to leak after the final setting as they do at first, and, further, if fillings made according to his technic continue airtight. I should also like for Dr. Harper to tell us the difference in the specific gravity of fillings made by other skilled operators and his. Cork is a very soft wood; however, it seals a bottle satisfactorily. But it is a very weak, soft substance. It seems to me that Dr. Harper's technic requires a softer mix of amalgam, and I wonder if he is able to eliminate as much mercury as is posible with a dryer mix. I would ask Dr. Harper if he is able to demonstrate that he secures a filling with a smaller amount of mercury by weighing the amount expelled in comparison to other test fillings made by other skilled operators. Certainly, an air-tight filling is desirable, and if we can secure it with the other desirable properties unimpaired, we should adopt Dr. Harper's technic. That it is definite and orderly we are fully persuaded and Dr. Harper tells us that it is within easy reach of any intelligent, careful operator. We have been told by Drs. Black and Harper that our over-plus of mercury does little if any harm; if expressed promptly, it does not effect shrinkage or expansion; why then should we think we are removing tin in any appreciable amount with the mercury? If we are able to remove tin in much excess it would cause undue expansion by throwing the alloy out of balance and it would indicate that the alloy was not perfectly combined. In a perfect combination, why should one metal be dissolved more than another? The strength of amalgam lies largely with the operator, but we cannot hope to avoid shrinkage and undue expansion in amalgam made from an unbalanced alloy.

J. V. Conzett, Dubuque, Iowa: Dr. Harper says that "Amalgam is the most generally used and the most abused of filling materials." One of the reasons that this is true is the apparent ease with which an amalgam filling may be made. I say apparent ease, for the fact of the matter is that the making of a good amalgam filling requires as much expert ability as the making of a good gold filling. There are two reasons for the extensive use of amalgam, the first financial, the second the tendency of the operator to take the line of least resistance. I do not think that there is the place for amalgam today that there was before the advent of the gold inlay, and I do not think that there is nearly so much used as there was before that time. But it is still being used extensively, and abused about as much as it has ever been, so the work of Dr. Harper in attempting to create an enthusiasm for better amalgam fillings promises better service to our patients. The mixing of amalgam is a most important procedure indeed, and an imperfect mix will make for failure, as he has said. There are many means of mixing the mass, the mortar and pestle which he has advocated, the mechanical mixers which are now on the market, and which will make a very good mix, and the spatulation method, which is the most expeditious and, if properly used, the most efficient. The proper amount of alloy and mercury are placed in a long narrow bottle and thoroughly shaken together for a minute, when they are spread out upon a clean block of paper and, with a large putty knife, are thoroughly spatulated. The mass becomes amalgamated in a very few strokes, but should be manipulated for a minute until the alloy is thoroughly incorporated in the mercury, when it is ready for use. But as has been said, the placing of the amalgam is the really important part of the operation; for no matter how good the amalgam may be, if it is not properly adapted to the cavity walls, the filling is bound to leak and will soon be a failure. The practice of

any man of observation affords him multitudinous evidences of the failures of amalgam fillings, and it is common to expect to find decay under an amalgam filling. But if the filling is made as advocated by Dr. Harper, and as a good operator would make a gold filling, that is, by stepping his plugger and working the filling material toward the cavity wall and then packing thoroughly against the walls of the cavity and filling in the center with strong condensation (and I like to use the mallet in finishing this part of the filling), it will stand the test of time as well as that of air.

Dr. Harper (closing): In the past, the merits of a dental alloy were judged by its freedom from shrinkage or expansion as measured by the amalgam micrometer. Shrinkage of one ten-thousandth inch, which we call a point, was considered fatal to adaptation, and expansion of more than two points was also considered unfavorable. Continued expansion, occasionally occurring in our test fillings and often seen in the mouth in old amalgam fillings, was generally attributed to the use of zinc in the formula. This is not true, because with one or not more than two exceptions, all high-grade alloys on the market contain from 0.5 to 2 per cent zinc, in spite of which millions of dependable fillings continue for many years to retain their form without evidence of movement. If zinc were responsible, we would rightly expect to observe movement in all of those fillings that contain zinc. All competent authorities have, by careful measured experiment, proved that zinc serves a purpose and is harmless in dental alloys when used within the limit of from 0.5 to 2 per cent. Dangerous movement in high-grade alloys is a result of faulty manipulation, not zinc, and the use of a correct amalgam technic will correct the fault. In the hundreds of test fillings I have made during the past eleven years, I find that we can have a wide range of movement, as expressed on the amalgam micrometer, shrinkage and expansion, without disturbing adaptation. I am prepared to demonstrate that, with amalgams that shrink as much as two points or expand as much as six points, I can make permanently nonleaking fillings. These test fillings will be made in proximoclusal forms, cut in nonyielding steel. If this can be accomplished in nonyielding steel cavities, we might expect fillings packed between cavity walls of dentin to retain their adaptation under a much wider range of movement. Any high grade, balanced alloy on the market today can be made to shrink or expand by the use of a faulty amalgam technic, whether it contains zinc or not. Ten years ago, I selected a group of well known alloys all of which contained zinc, and made test fillings. Those that stood up under 20 or more pounds of air I have continued to observe, and without a single exception all are standing up to the original test today. This stability is a result of thorough mixing, and a forcible and orderly packing sufficient to most completely remove the unattached tin and excess mercury. Most manufacturers use zinc in their formula to make the amalgam work clean in the hand. Many high grade alloys darken the hand when kneaded, and with the same formula, with from 1 to 2 per cent of zinc added, the amalgam will be clean when kneaded.

PROFESSIONAL EDUCATIONAL AND EXECUTIVE PROBLEMS*

By GEORGE L. POWERS, D.D.S., F.A.C.D., Memphis, Tennessee

SINCE the organization of the National Association of Dental Examiners (1883), this has probably been the most momentous year in its history. Owing to the constructive work of the committees, it has been a most successful year.

DENTAL HYGIENISTS

Within the past few years, some encouragement has been given to the teaching and licensing of dental hygienists. As an assistant to the dentist, she can be, and is in many instances, invaluable to both her employer and his patients. Her purpose and service is legally and professionally limited, and as long as she occupies strictly her own position, determined by her employer, I have nothing to say in criticism. Her teaching and knowledge is limited to specific work, and it is illegal and dangerous for her to attempt to go beyond this. Unfortunately, there is a tendency on the part of some hygienists to go outside their field, in which case they may become a menace to the public and the profession. Members of the profession, and particularly dental examiners, should exercise great care relative to the character and ability of applicants for license. In my judgment, any state is better off which has no law legalizing dental hygienists. Dentists should be careful regarding the authority given these assistants.

SO-CALLED "MECHANICAL DENTISTS"

So-called mechanical dentists do not include the efficient and orderly class of laboratory men in many offices and laboratories throughout the country. As long as laboratory men remain in their sphere, we should appreciate and encourage them. "Mechanical dentists" is a usurped and deceiving title. This type of operator is a menace to the public and the profession. There should be no friction among high class laboratory men and dentists, and there is none; but these so-called "mechanical dentists," totally unqualified even to enter a dental college, go out after taking a few months' course in minor mechanics given by the government, or with a little pickup information, to say to the public "I am a mechanical dentist." It is hard to understand how, in the face of insistent demands for intelligence in public health service the so-called "mechanical dentists," knowingly unqualified, would dare to tamper with human health. Diligent attention should be given this matter here and in our individual states, as there seems to be a tendency on the part of some to attempt to secure passage of special legislative acts to grant them permission to practice even though they may never have seen a dental college or heard a lecture.

*Annual address of the president of the National Association of Dental Examiners, Louisville, Ky., Sept. 21, 1925.

STATE BOARDS OF DENTAL EXAMINERS

Every man placed on a board of dental examiners should be intelligent, of mature judgment, outstanding as a citizen, and with the courage to make his own decisions and stand by the convictions of his own conscience. If we have unreliable, weak and unfit men on our boards, they should be asked to resign. There are no more important professional positions than these. Our boards should contain our ablest men. State laws are not sufficiently enforced; partly because of lack of study of the existing facts and conditions as compared with the law, and failure to make the effort necessary to carry out successfully a desired policy. Another reason is lack of proper funds. Every board should have a fund, or immediately create one, so that it can have the financial backing necessary to obtain a conviction or a vindication in all digressions from the law. Let us see that dentistry is practiced honestly and fairly. With a high examining board personnel, high professional standards will automatically obtain and better men be licensed to serve the public. A system whereby state boards could be standardized might be worth consideration. The terms of board members should be varied in such manner that there could be no possibility of any state having a board composed entirely of new members at any one time. Laws of states should be so worded that those who are appointed by governors of states to the boards of dental examiners "shall be appointed from a list recommended by the state society."

DENTAL COLLEGES

In this country, B and C colleges are still tolerated. Most dental colleges deserve commendation for their efforts toward good instruction and conformity to ideals as laid out by the dental profession. All dental colleges should, within a definite period, be in class A. C colleges should be raised to class A or be discontinued by all state boards refusing to accept their output. We can see no excuse for the continuation of C schools that have had years in which to improve and yet are known to have a very low rating and no classification by the council. I fail to see how we can reconcile A and C colleges. Through the dental colleges, the standards of dentistry can be raised and men be sent into the profession who are technically proficient, and whose professional and civic ideals are outstanding. "Brain work" is evaluated by the public as of far greater worth than "hand work." There can be no expert digital technic except that which is directed and guided by a well and thoroughly trained mind. The hand and its executions follow the culture, maturity and imagination of the mind. Failure properly to train the mind means general failure. Colleges employ too many low-visioned and unqualified instructors, and as a result the graduate student is short on professional vision and intelligence. The general public welfare would be better conserved by better equipped faculties, men who can teach definitely and specifically what should be useful to a doctor of dental surgery in the capacity of a public health agent.

DENTAL EDUCATIONAL COUNCIL OF AMERICA

The Council, its personnel and accomplishments, is an able, conscientious and effective organization carrying on in a manner which merits our generous applause. To this body, we should

send our most able and active men; for the problems they handle demand men of action, intelligence, experience and decision. Our thanks go out to these competent and tireless men who so ably represent us in this joint assembly. We should freely support their programs and efforts.

CARNEGIE CORPORATION

In conformity with the purpose and policy of its founder, the Carnegie Corporation sent its forces into the field of dental research in conjunction with and at the desire of the profession, with a view to systematizing and standardizing our dental education so that it might be projected to the greatest efficiency. The corporation made a thorough survey, as you know, and is now perhaps in a position to effect great things for the dental profession which it could not easily do alone. The National Association of Dental Examiners is grateful to the Corporation for its efforts in our behalf. Dr. Gies, honorary member of this organization, has labored intelligently and faithfully with us and for us, and he deserves an expression of our commendation. The Corporation stands with all its forces and money to aid our cause in proportion to our own faith, efforts and vision. I feel that we shall avail ourselves of opportunities that others have visualized.

LEGISLATION

A program of constructive legislation in this country with reference to dental matters of states individually and collectively is of extreme importance. Your particular attention is called to the necessity for the prevention and rejection of vicious and destructive legislation. Bills may be introduced in state legislatures in an attempt to legalize wholly unqualified men to practice dentistry, to the detriment of public welfare and health. When the rights of the public and the ideals of the dental profession are thus threatened, it is time to be on our guard. So let us, first, enact constructive progressive legislation; and, second, array our efforts against the enactment of legislation which impairs the welfare of the public health and the public health service of the dental profession.

DENTAL EDUCATION

Dental education reaches the very heart of our future as a profession. Much has been said concerning the best system of college teaching. Today, we are facing the time in which we are going to have to stand and deliver. There can be do doubt that dental teaching should be systematized in some manner whereby the profession of dentistry and its service to the country may be more broadly created and delivered. In every vocation, there is a demand for higher intelligence, looking toward greater efficiency. The business man, plowman, minister, lawyer and the general public have more intelligence now than history has ever known. The public is more informed and demand higher intelligence from those who serve them.

To careful observers, the dental graduate of today is lacking in academic training. The outstanding thing needed is to equip those entering dental colleges with a fundamental training so that they may rank by comparison with any other group of professional or business people. Our profession is judged largely by the individuals composing it. How do your representatives compare in the public eyes with others? How many are recognized as leaders of their respective sections? How many display that intelligence and bearing desired of

professional representatives? Can your students sit in the same classes with medical students for the same instruction? Can your doctors of dentistry participate in discussions of other scientific bodies with credit? I ask these questions, not in criticism or derision, for I believe the dental profession is doing more good to and for humanity than any other practicing the healing art. But what would the profession be and do if it had the advantage of more education? Doctors of dentistry of today, tomorrow cannot "get by" on the education possessed by their predecessors. Each dentist should be so trained and educated that he may be an individual unit from an intellectual and cultural point of view.

Big and broad as is the training necessary for entrance into the practice of dentistry, we shall not stop there. We shall in the future not alone obtain a greater vision of the intelligence necessary for dentistry, but also shall reach beyond to that mind and heart training which shall make of all our members God-fearing, fellow-loving and public-health-serving units. Dentistry has the opportunity for advanced health service. There was a time when our work was largely mechanical, but now it is different, and in the future will be more so. Today, we are agents serving the general public in the capacity of guardians of their health. There can be no doubt that dental students should possess just as much education and be just as well prepared when they enter college as are medical students. Each has the same fundamental work and health problems to attend and by all means should sit in the same class rooms at all universities. Students could not grasp the same teaching unless they possessed practically the same minds, developed by the same, or equivalent, preliminary training. In all the early dentomedical teaching of both dental and medical students, the same program should be followed. All universities could teach dental and medical students assembled in the same classes more advantageously and more economically. One year predental training today, tomorrow is noticeably insufficient. This probably would not be questioned by any who have given the matter study. Students with more predental education can better grasp, from beginning to end, the whole of dentistry, and, when they go out into the world, can be of more force in presenting themselves and the profession to the public. We need improvement of the individual unit and, to accomplish this, the unit needs more sense and training to start with.

We would not lessen the very necessary intensified dental teaching. I am constrained to believe that the plan of dental education known as the "2-3-graduate plan," with possible modifications, is an acceptable solution of our dental teaching problem. Certainly, the two predental years are necessary. The proposed three-year course of intensified dental teaching, eliminating all but strictly dental subjects, seems sufficient. I would advocate three years of longer teaching terms than are at present taught, if it should be found insufficient. The one year for specialty training seems timely.

NATIONAL BOARD OF DENTAL EXAMINERS

At the Dallas meeting, I was instructed to appoint a national board committee, whose duty was to make a survey and formulate a plan for the creation and maintenance of a national board of dental examiners. Conscious

of the fact that this was the most important matter before this organization, as well as the dental profession, in a long time, I devoted much time and serious thought to the selection of the committee, endeavoring to secure men whose judgment was sound and who were compatible and interested only in the welfare of the dental profession in its relation to public health service. The personnel of the committee is Drs. Walz, Reynolds, Campbell, Haig and Giffen, and they have worked honestly and intelligently for your interests. They have arrived at a basis for future achievement far in excess of anything we have ever done. Each of the United States has appointed a state board of dental examiners. In their respective states, they are sole authority on matters legal and executive pertaining to dentistry, and to them the profession looks for protection and guidance.

We as individuals owe our forefathers in dentistry everything and we may well be humble when we consider all that we have been handed without effort on our part. As state boards we must not function for ourselves alone and those within our state and be disinterested in the affairs of the whole profession. There is no state or country in the world which has the right to segregate itself within a circumscribed wall, separated from all vital and interrelated matters which should be held in common. It is not within the jurisdiction of a state board to establish geographic limitations and unalterable and unfair exclusions. The majority of the profession feel that there should be more equitable consideration in transferring from one state to another. The claim is made by some boards that standards are not equal. This is one great reason for the establishment of the national board, that it may act in an advisory and leveling capacity, to systematize all requirements and relative matters so that all will be equal.

A medium which would make uniform general requirements, examinations, laws and board personnel would be welcome. In all considerations relative to this matter, I believe that each state board should be maintained in all its state's rights and that in no way or manner should anything interfere in the least with the full and independent functioning of each state board as it is at present constituted. In the plan promulgated by your committee, there is no intention of interfering with the individuality of any state board in the least. We have come to the time when something must be done. The American Dental Association, Faculties Association, Educational Council of America and general dentistry calls on this organization to foster a national board plan duly safeguarded for the interests of dentistry. The national board, when authorized by this body and organized, shall be in fact an advisory board for all state boards who care to affiliate. There can be no legal status for this national board and no effort to establish such a status is contemplated. This board shall be used as a medium by and through which we may more nearly equalize, systematize and standardize dentistry in all its phases in the entire country.

The Carnegie Corporation, which is, as you know, an organization interested in general education and in placing its funds where seemingly they will afford the best public good, is not averse to aiding the dental profession to put on a great program. In fact, this national board is one of the strong features nec-

essary to so systematize matters that the great educational and progressive dental program may be projected. All organizations of the dental profession have had joint committees with ours in the compilation of this national board plan and, when presented to you, it will be the combined official plan. The National Association of Dental Examiners is the logical organization to originate and adopt the national board program and medium. The profession we serve awaits our approval of this great demand for the public and professional welfare. I am sure we shall not pass by this opportunity for such a great forward step, in the unprecedented program of dentistry now pending, taking this stand as a part of our national record and history.

FLOATING TOOTH IN LEFT ANTRUM

REPORT OF CASE

By J. A. NYE, D.D.S., Ida Grove, Iowa

History.—H. S., aged 20, a farmer, admitted to the Ida Grove Hospital, June 22, referred by Dr. W. Jones of Schleswig, Iowa, to Drs. Parker and Armstrong, with myself as consultant, gave a negative family history. He had had no serious illness. About three months before examination he had noticed a slight swelling and occasional moderate pain in the upper left side of the face. Pain increased gradually. He experienced difficulty in opening the jaws, and had more or less foul discharge about the upper teeth on the left side.

Physical Examination.—The temperature was 102; pulse, 92. Otherwise, the general examination was completely negative, the patient being strong and healthy. There was a dense hard swelling under and back of the left malar, which distended the face markedly. The second and third molars were missing. The first molar was carious and loose. Bone crepitus was evident to the examining finger at the posterolateral wall of the antrum, and hard, dense tissue at the reflection of the mucous membrane to the buccal wall. There was a discharge of foul pus from a sinus just back of the first molar. A probe passed directly into the antrum (left.)

Roentgen-Ray Examination.—There was dense clouding throughout the left antrum, with the opacity extending outward farther than the ordinary limit of the antrum. A fully formed molar tooth lay apparently free in this antrum, with the long axis of the tooth horizontally placed, the crown of the tooth pointing down and out. The three roots of the first molar extended into the antrum cavity and showed absorption.

Operation.—Under general anesthesia, a lateral flap was turned up from the second bicuspid posteriorly to the tuberosity. Immediately, fragments of the bony outer wall of the antrum were encountered. Fragments were free and were picked out with forceps. The first molar was extracted. Dense friable granulation tissue was then picked out with forceps, partly within and partly without the antrum. The finger, introduced into this spontaneously ruptured cavity, encountered the tooth in a mass of granulation tissue. The tooth was lifted out with the finger without much difficulty. About one and one-half ounces of granulation tissue was then scooped out, leaving the antrum cavity free. The bony wall of the antrum was removed from the region of the second bicuspid, posterior to and exposing the pterygoid process, and upward to the malar.

The flap was replaced by two catgut stitches, ample room being left for drainage.

Subsequent Treatment.—An ice bag was applied, and the antrum was washed out daily

with boric acid solution. The temperature subsided the second day. The patient remained in hospital for five days and seemed to be making an uneventful recovery.

Fig. 1.—Anteroposterior view showing tooth in left antrum.

Fig. 2.—Stereoroentgenogram showing tooth in antrum.

IMPORTANCE OF EXAMINATION; TISSUE RESILIENCY*

By WILLIAM MARCUS RANDALL, D.D.S., Louisville, Kentucky

IT has always been recognized that a correct and definite diagnosis in the "healing art," or any of its varied specialties, is the essential foundation to a successful treatment of the case.

If dentistry is to be considered any portion of the great mission to humanity, why should it not obey this fundamental law, of examination, diagnosis and treatment, as it is observed in all the other ills to which the human flesh is heir?

After a considerable review of all the textbooks on prosthetic dentistry and the Dental Index, and the examination of dozens of articles on related subjects, we fail to find this topic given its full significance as it relates to denture construction, and in but few instances do we find it presented in a systematic, tangible and usable form.

In order to do the greatest amount of good for the greatest number of cases treated, it seems that three things should be kept in mind in mouth examinations:

1. A definite record of the findings made in the examination, put down in black and white.

2. A more nearly standardized method of making such examination and keeping the record chart.

3. Equal emphasis on the oral history, anatomic, physiologic and pathologic, and the physical and mechanical problems of the case.

At the outset, if the case is edentulous or there are a few teeth or roots remaining, a roentgen-ray examination of the full upper and lower arches should be taken in order definitely to locate any uncovered causes for difficulties in the making or wearing of dentures. With the record of the Mayo clinic of some type of oral pathologic process in 65 per cent of edentulous mouths, together with the all too frequent hidden causes, in our clinical cases of unsuccessful full dentures we feel that this initial step cannot be overestimated.

The complete elimination of all pathologic manifestations or physical conditions demanding either surgical interference or therapeutic treatment should naturally be the next step after the roentgen-ray and other examinations have been completed as directed by the blank chart before us. While it is a minor operation, the removal of soft flabby tissue, the smoothing of the spinous extension of the alveolar crest or the clipping of one or more of the frena should be done at the same time any retained teeth, roots or granulomas

*Read before the Section on Full Denture Prosthesis at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1925.

are removed or any portion of the alveolar process is resected.

Previous to, during and after making the examination and recording the full details of the findings, there is one outstanding factor which we have found to have at least an indirect, and in a number of cases a direct, bearing on the ultimate success we attain in full denture service, and that is the attitude of our patients toward their edentulous condition and the wearing of dentures in general, and especially in their particular case; in other words, without giving too much importance to the subject, by asking too personal or direct questions, it behooves the operator to determine the exact position the patient has assumed in regard to the wearing of dentures. Otherwise, however definite and complete our diagnostic record, our prognosis cannot be finally rendered until this psychologic factor has been considered and to what degree the patient is willing to cooperate with the dentist to make the most of a bad situation.

The psychology of denture service is not the least of the several factors to be determined in executing the preliminaries necessary for rendering a prognosis of the case. However, I should in the main limit my consideration of this factor to the preparation of the mouth and patient rather than to the technical procedures to follow.

From our clinical observations, we are led to believe that too much emphasis has been given (and by some of our best men) to the psychologic phase of denture service. We have noticed that for the most part, after we have once begun the construction of the denture and during the period of our patient's getting accustomed to wearing it, his complaints and criticisms are more frequently valid and just than otherwise. Although it can be done, we shall not purposely resort to hypnotism or the power of suggestion to the degree to which some claim to use it. There is always a sufficient amount of this phase of our practice which unsolicited creeps in, on the part of both the patient and the dentist. If it were not for this factor, coupled with much that is not known by either patient or dentist, how could the tens of thousands of patients wearing dentures get along with them at all?

Having secured a fairly accurate relation of the study models on the occlusion frame, a detailed study should be made of the physics of the case, from a standpoint of the various lines of stress between the superior and inferior arches of the individual case and as directed toward the crest of the ridges, considering the respective sections of the ridges hereafter referred to as the unit areas.

We have found that a diagrammatic drawing of the lines of stress, as related in angular directions to a perpendicular representing the median line between the crests of the ridges on either side, is a great aid in securing a more definite and accurate balance, through the antagonizing teeth in their arrangement for the greatest stability and use of leverage as a positive factor in retention. We think these mechanical efficiency problems can best be controlled by giving them study and consideration in our preliminary work. In other words, a thorough study of all the problems and difficulties and how to surmount them in our construction, even

before taking our final impressions, is just as important in the "how" and "when" of our technical procedures, as

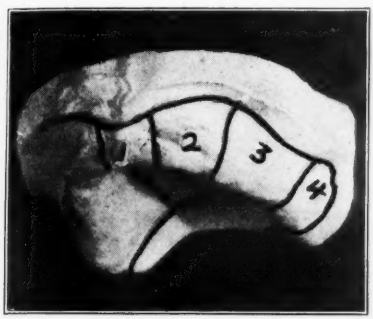

Fig. 1.—Units of area 1-2-3 and 4 on the labial and buccal alveolar inclines and peripheral borders of the superior arch.

it is for the architect to consider all of the varied relations of each part of his structure to every other part, even before he takes any steps toward making

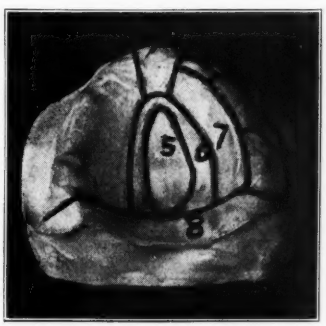

Fig. 2.—The five units of area in the vault, including the location of the posterior boundary of the plate.

excavations or letting a contract for construction.

Figures 6 and 7 present a form of clinical chart in detail of the patient's condition and the operator's conclusions for construction, and a graphic chart

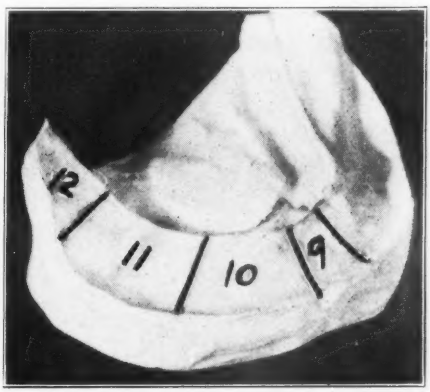

Fig. 3.—The four units of area on the labial and buccal inclines of the alveolar ridge together with the peripheral border of the lower arch.

for recording the findings of any particular case, as presented by Dr. H. W.

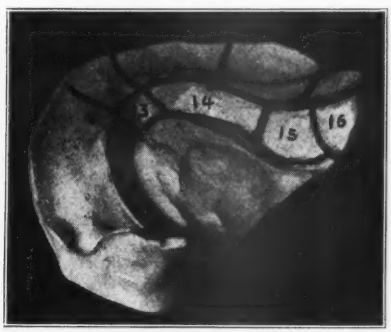

Fig. 4.—The four units of area on the lingual incline of the lower arch together with the peripheral border.

Wright, which I believe to be the most complete form of examination chart yet presented to us.

TECHNIC OF EXAMINATION

Because of the influence of the different sections or areas and of the different abnormalities found, I have divided the arches into separate units for the convenience of a more definite system of examination of the upper and lower arches, afterwards correlating the findings made in each unit and as related to each other in the following points of study: radiographically, anatomically, physiologically, pathologically, physically and mechanically. Thus, with six points of comparative study for each unit of area in each arch of twelve each, we could have a definite and complete record of each arch separately and comparatively.

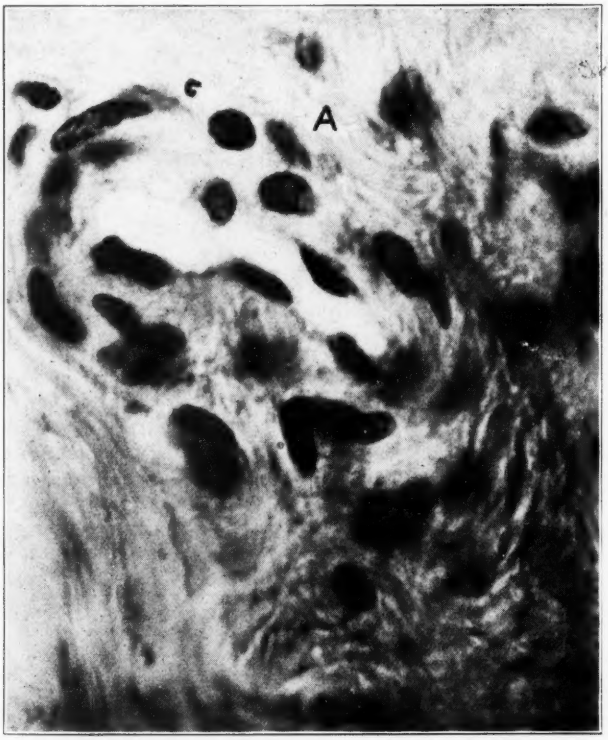

Fig. 5.—Cross-section of enlarged tuberosities described in text; diagnosed as cartilagenous nuclei in the lettered areas.

Figure 1 presents the units of area numbers 1, 2, 3 and 4 on the labial and buccal alveolar inclines and peripheral border areas of the superior arch and tuberosity. Figure 2 shows the five units of area in the vault including the location of the posterior boundary of the plate, together with the three

units of area on the opposite labial and buccal alveolar inclines and peripheral positions, giving us twelve units of area in the upper arch. Figure 3 presents the four units of area on the labial and lower arch or twenty-six in both arches. Thus, we would have a complete and definite record of the different factors to be considered in each area separately and comparatively.

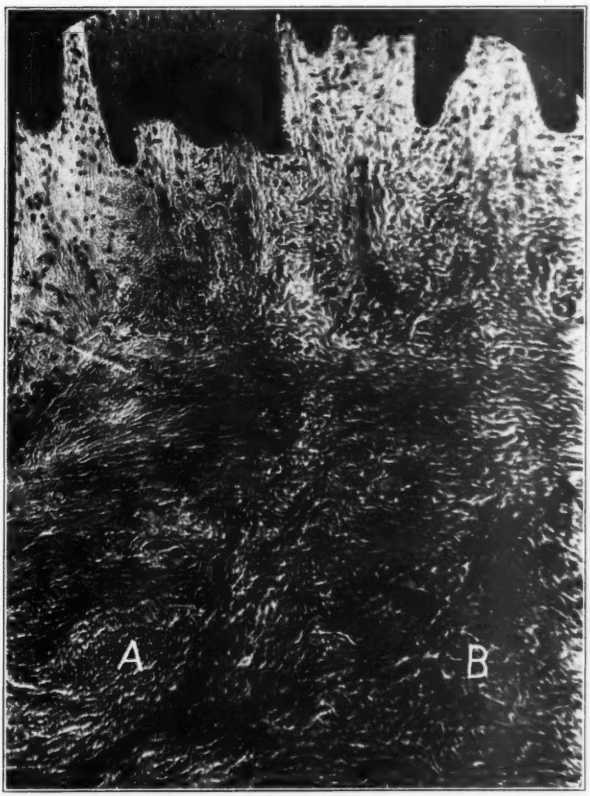

Fig. 6.—Cross-section of enlarged tuberosities described in text; diagnosed as cartilagenous nuclei in the lettered areas.

buccal inclines of the alveolar ridge, together with the peripheral border of the lower arch. Figure 4 presents the four units of area on the lingual peripheral border, with the six similar areas on the opposite lower arch; making fourteen separate units for study in the

We next proceed to make snap impressions of both arches, preferably of a quick and brittle compound, together with a fairly accurate biscuit bite; for the purpose of making and mounting further study models.

With a photo-chart print of the

arches subdivided into unit areas, such as we have heretofore presented, and additional blank spaces for recording the findings in each unit, we think it would be still better.

Fig. 7.—Cross-section of enlarged tuberosities described in text; diagnosed as cartilagenous nuclei in the lettered areas.

RESILIENCY

In a somewhat exhaustive review of the dental and physical literature, we have been amazed at the limited information presented on the subject of resiliency. The term is derived from a latin stem meaning to rebound, to react; while from the point of view of the physicist it seems to be synonymous with the property of elasticity, which is the physical property that matter of any kind has of returning to its original position or form, after being compressed, twisted or stretched. In consideration of its full meaning and scope of influence in denture service, it is a factor to be considered from three different anatomic locations and as many different mechanical problems in denture service: (1) the supporting soft tissue base in contact with the

dentures during masticatory stresses; (2) the temporomandibular intercartilagenous capsule in the various mandibular positions and degree of stress; and (3) the pull of the muscles of mastication as expressed in the various directions and degrees of intensity of the masticatory stresses.

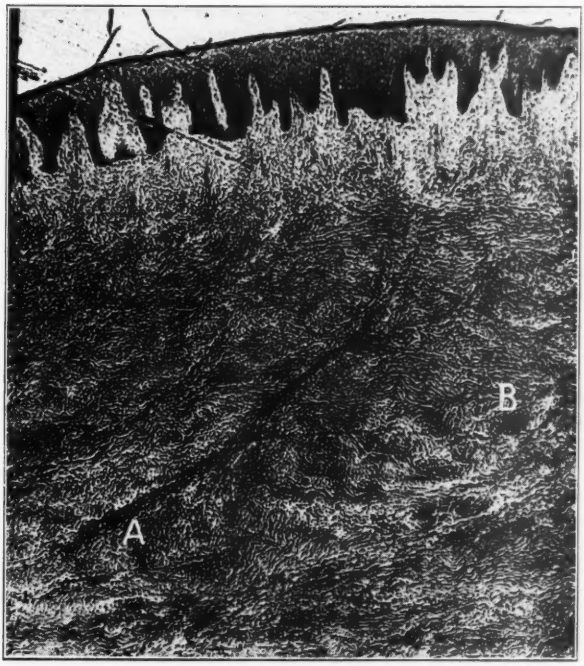

Fig. 8.—Cross-section of enlarged tuberosities described in text; diagnosed as cartilagenous nuclei in the lettered areas.

In each of these locations where resiliency plays a part in the function of artificial dentures, there are present physical, anatomic and biologic problems. With the limited time available, I shall confine the discussion to the first named: resiliency as applicable to the tissue supporting the denture base.

We at once recognize three phases of study and observation, as follows: (1) the anatomic development as to form and thickness in the individual arch and as related to the antagonizing arch; (2) the biologic characteristics presented in this tissue in its texture, mobility, varying degrees of compressibility or its tone and tension, as brought about by surgical interference or as the result of function, and (3) a full and detailed consideration of all of the mechanical influence on denture construction, due to the mutual relations presented by the mouth and features either as a whole or in a segmental part.

In a somewhat extensive survey made of dozens of edentulous mouths, from both a physical and a radiographic examination, we have observed two conditions:

1. In edentulous mouths that have been without teeth for some time, and in direct ratio to the lapse of time during which the patient had been "gumming it," there appears to be, except in the cases of organic disease, a much denser and a smaller amount of resilient tissue than in healthful mouths which had been edentulous practically the same length of time but which had worn artificial dentures.

2. There seems to be a definite biologic relationship between the quantity or thickness of the resilient tissue and the degree of cancellation of the supporting bony tissue; the more resilient the tissue, the less compact and resistant the supporting bony structure; the length of time exposures, distance from the subject, intensity of current and angle of rays, as well as the developing technic, being as nearly uniform in these cases as is practicable with the

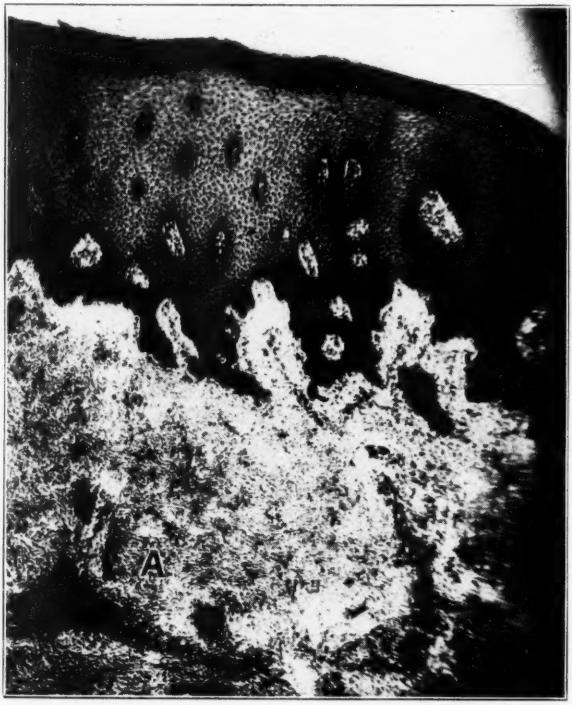

Fig. 9.—Cross-section of an edentulous gum at the median line of the superior alveolar ridge of a calf 6 hours old.

ordinary roentgen-ray examination, taken at different times.

3. Function without mechanical irritation produces a more nearly uniform, healthful and resistant type of both the resilient layer and bony supporting tissue.

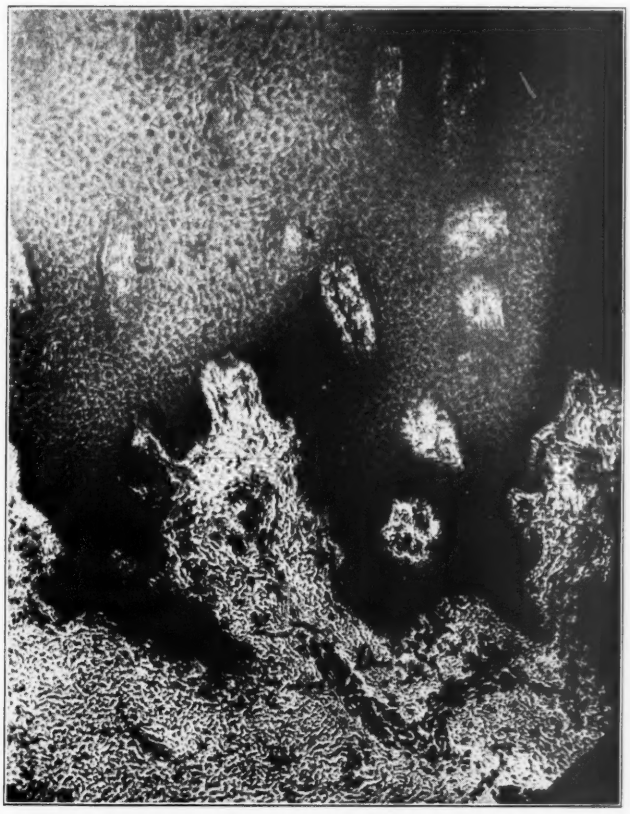

Fig. 10.—Cross-section of an edentulous gum of a cow 6 years old; diagnosis: cartilagenous nuclei.

REPORT OF CASE

Mrs. A., came to the college clinic for denture service, and on examination, it was found that there was an excessive growth of resilient tissue over each of the tuberosities and graduated in thickness, disappearing completely in the location of the mesial of the first molars. The second lower molars tilted mesially, and every time the patient closed the jaws, the distal cusps of these lower molars produced excessive pressure on the resilient tissue covering the tuberosities.

This excessive tissue was surgically removed and submitted to the pathologic laboratory for examination and diagnosis. The finding was: cartilagenous tissue and fibrous tissue covered with squamous epithelium.

The patient was otherwise healthy, and doubtless, in time, the influence of function on this tissue would have stimulated the development of true cartilage. There is no other explanation for the presence of these cartilagenous nuclei (Figs. 5-8) except for unusual and excessive use, in a healthy subject in middle life, and without sufficient irritation to produce a pathologic condition.

Figure 9 shows the edentulous gum at the median line of the superior alveolar ridge of a calf 6 hours old, with undeveloped cartilagenous cells and a somewhat denser consistency than in the human gum in the previous four slides.

Figure 10 shows the gum tissue taken from exactly the same anatomic location as in Figure 9, but from a cow 6 years old; which clearly demonstrates the differences in the biologic changes occurring through the influence of function; microscopically, a much denser, more cartilagenous tissue.

TREATMENT

We are firmly of the opinion that, in all cases in which there is an excessive quantity of resilient tissue, it should be surgically removed, to the end that we may have a firmer and a more nearly uniform resistant supporting base for our dentures.

From the foregoing specimens, we must admit that the influence of function of the parts of alveolar ridge, with and without dentures, is an outstanding factor in the type of changes that will take place in the soft, medium and hard resilient tissue and also in its bony support.

We should use a carefully planned and well developed technic in our impression work, to the end that we may secure a uniformly well adapted and equitably distributed pressure over the entire area of this resilient tissue in contact with the dentures.

We also grant that a very close study of the lines of force and of the physics entering into the problem of balanced stresses in antagonization of the dentures, both in the technic of arranging the artificial teeth and in the more accurate balance of pressure to be obtained by the regrinding of the finished dentures, both on the adaptable articulators and in the mouth, are important factors in the success or failure of the completed result.

Then, again, if the influence of use and function is to play any part in the physiologic state of this tissue, does not the treatment of rebasing our denture from time to time come to demand more important consideration than we have probably given to it in the past? We are all acquainted with the superior advantages to be gained from the rebasing technic in partial dentures for a more equitable balance of stress; and why is not the physical principle, although acting somewhat differently, just as applicable in full dentures?

The wearing of carefully fitted metal bases will cause less change in permanent ridges, so-called, in the same length of time than a vegetative base after the bony ridge has become permanent and smooth.

The degree of effect the resilient tissue will have on the fitting and on securing the balance of antagonization, on getting the patient accustomed to wearing dentures and on the length of

time we may expect to maintain serviceable and well-fitting dentures will be in direct proportion to the quantity and quality of the resilient tissue in a given case and the uniformity or inequality of its distribution over the bony tissue supporting the dentures.

Only by a thorough consideration of all of the factors in resiliency, together with their mutual relationship with all the other important sign-posts, in the construction, outlook and prognosis from the conditions presenting in a given case, historically, physiologically and physically, can we expect to cope in the most successful manner with this more or less intangible, but none the less real, problem in denture service.

CONCLUSIONS

1. A thorough and careful examination should be made of the mouth and pharynx (*a*) historically, (*b*) anatomically, (*c*) radiographically, (*d*) physiologically, (*e*) pathologically, (*f*) physically and (*g*) mechanically.

2. An accurate record of this examination should be made from the points of view of: (*a*) the patients, (*b*) the dentists, and (*c*) esthetics.

3. The attitude of the patient as regards cooperating in a definite and determined way with the dentist should be ascertained.

4. For all full upper and lower cases, study models should be made and mounted for a further study and observation of the physical relations presenting between the arches.

5. The problem of resilient tissue should be considered as related to denture construction in the case in hand: (*a*) conditions at present (1) anatomic, (2) physiologic, (3) pathologic and (4) mechanical; (*b*) prognosis after use (1) anatomic, (2) mechanical and (3) biologic.

6. A careful consideration should be given the influence of function on the changes in the resilient tissue and the practice of advising patients concerning the need for occasionally rebasing, if not rebuilding, the dentures.

7. The sane and judicial use of surgical interference should be practiced where indicated.

8. Extreme care should be used in the impression technic, regardless of the method used, in order to secure a uniform adaptation without too excessive pressure or compression in the soft areas, or, on the other hand, too much relief of the hard areas, a uniform adaptation and peripheral seal with a balanced pressure.

9. We should give a careful study to the physics and the mechanical problems to be met in the individual case, and there should be careful, previous planning on the part of the operator, that he may more thoroughly know just how to handle the case problems in the most advantageous manner for securing balanced dentures under the varying mandibular stresses.

10. The most satisfactory results will not be attained by the too intensive specializing of our efforts along a single line of study, such as of the resiliency problem, unless, at the same time, we give due consideration to the relationship which this factor will have to all the other and equally important problems in denture service.

DISCUSSION

E. J. Farmer, Buffalo, N. Y.: Unless we have the knowledge and means of diagnosing our case, how can we hope to be successful in prescribing the proper treatment? The phy-

sician is called to see a patient. What equipment should he possess? 1. A thorough knowledge of the "healing art." 2. The necessary instruments for obtaining and recording existing conditions. 3. The skill to use these instruments. 4. The ability to interpret and classify his findings. His diagnosis and conclusions are reached by comparing these findings with the accepted standard of the normal. If his diagnosis is correct, the treatment usually is a matter of simple and definite procedure, at times routine. If the diagnosis is questionable, the treatment prescribed can be nothing short of guesswork. If he guesses right, he may expect the patient to recover. If he guesses wrong, the patient, at times, may recover. What particular bearing has this simple, but well known simile on the subject under discussion, mouth examination and tissue resiliency? Our patients come to us for service which conforms to the situation that the patient is in when he calls the physician. He needs our services to restore his masticating apparatus to a properly functioning condition. How can we hope to prescribe before we have diagnosed? Hardly two patients possess the same mouth and tissue conditions, and when we appreciate this fact and the tremendous bearing these conditions have on the construction and comfortable wearing of dentures, we will cease to consider that as our first step, we are to prescribe and take the permanent impression. Is it any wonder that so many failures result in this admittedly very difficult branch of our profession, discouraging both the patient and the dentist? Examination as to tissue condition, shape, form and relative position of the supporting structures, together with the physical and mental attitude of the patient, as preliminaries cannot be overlooked. However, we should consider our original diagnosis and conclusion, subject to modification as the work progresses. We must repeatedly check-up and readjust our work in order to provide for the tissue changes which will occur during the wearing of the dentures, so that ultimately excessive resorption of the supporting tissues may be minimized. Dr. Randall advocates the dividing of the arches into twenty-six areas for the purpose of recording tissue conditions. I consider such a procedure to be very necessary in teaching, for orientation and for developing the capacity of the student for observation; but as a routine for the practitioner, it means the consumption of unnecessary time. Records to be of value should be such that their interpretation is uniform. We have no precision instruments for testing the tissue condition of these individual areas; therefore, our records of the resiliency of these areas cannot be precision records. A relative survey of tissue conditions without absolute records, I believe sufficient for the practitioner and specialist. Only recently have we been enabled to measure and to give due consideration to the resilient effect of the denture supporting tissues as a whole. You are referred to Hanau's method of making records of strained and unstrained jaw relations, as used in his denture correction technic. I do not wish to be understood as advocating that the prosthodontist need not be familiar with every fundamental underlying denture construction. He surely must. But let the technical procedure be as simple, for such it is, as is consistent with the highest type of denture construction. We should strive to reach our destination by the shortest and safest route. There are, however, two outstanding areas in the upper mouth which are of especial interest in designing the upper denture: the hamular process of the internal pterygoid plate; and the space formed between the cheek and tuberosity back of the malar process. This area I have termed the post malar pocket since I have found no term applying to this area in textbooks on anatomy. The hamular process possibly is the area referred to by Clapp and Trench in their sketch on page 15 of the professional denture service, under the note "spines behind palatine canals may require relief." If it is the hamular process to which they refer, it is located too far forward on the chart. The base of our denture should never extend over these processes, because of muscle pull and consequent temporary resilient effect, not to speak of the pain produced by the base resting upon these slender bones. They may be readily located in most edentulous mouths by sliding the finger up the disto-lingual slope to the tuberosity to a point from one-eighth to three-eights inch distolingual to the tuberosity. They appear as small resistant areas covered by the tissues of the soft palate. Between these processes and the tuberosities are narrow areas of resilient and displaceable tissue,

which determines the postdam and border of the denture. Between these two areas across the palate, the postdam and border is determined by the area of displaceable, immovable soft tissue. Should the hamular process be very prominent and close to the tuberosity and incidently covered with the denture base, then, severe pain may be produced which the patient can seldom locate. This would render the denture unbearable after being worn only a short time. These areas must be considered at the time of taking the impression. The second area referred to is the postmalar pocket. It is of especial importance only in the mouths of certain patients. Usually, the cheek tissues in this area, as well as farther mesially, remain in contact with the side of the ridge when the mouth is opened as in the act of yawning. In this case, the cheek will remain in contact with the flange of the denture, when the mouth is opened widely, thus maintaining the peripheral seal. In a few cases, the cheek tissues back of the malar process arch decidedly outward, and draw away from the buccal surface of the tuberosity when the mouth is opened widely. In this case the peripheral seal will not be maintained unless the flange is carried high and terminates in a thick roll. This is usually found in mouths of patients who are extremely emaciated. I have gone into detail regarding these supporting areas, because analogous consideration has to be given other areas, when considering their ultimate resilient effect. The resilient effect of the tissues on a denture depends, first, on the area and, secondly, on the formation of the supporting surfaces. Therefore, any change of either, or both, will effect the correctness of the original measurements upon which is based our denture construction. The use of the roentgen-ray as an aid in determining pathologic areas, I am sure, is generally accepted as an indispensable agent; and the proper surgical trimming and smoothing of the ridges in preparation for the building of dentures tends to eliminate unpleasant irritation during the time of denture construction and lessens the difficulties during the "learning to wear" period. We realize that irritation means hypertrophy, usually followed by resorption, resulting in a change of form of the supporting tissue areas. This, in turn, means a change of their resilient effect on the dentures; the very condition that we wish to avoid for reasons mentioned before. Surgical preparation should be made with extreme precaution, and after a careful study of ridge relations, I fear that many good mouths have been spoiled by indiscriminate surgery. Dr. Randall has observed resilient tissue more frequently in mouths that have worn dentures than in mouths which have been "gumming it." My observations are the same, and I attribute this condition to the wearing of unbalanced dentures. I should expect that the cancellation of the bony tissues is the result of irritation of the overlying soft tissues. The statement that "function without mechanical irritation produces a more uniform, healthful and resilient type of both the resilient layer and bony supporting tissue" should be printed in italics, because so important.

J. W. Crawford, Milwaukee, Wis.: I agree that a closer examination and record should be kept, but the average man will not, or has not the time to, make the examination and record it. He is interested mainly in how to overcome his failures in denture construction, not realizing that the conditions of the edentulous mouth must be studied in detail and such examination recorded on paper, before he can become familiar enough with the varying conditions to carry them in his mind's eye and mentally plan the correction of the defects. At Marquette University, Dental School, we use Dr. Wright's chart, and find it a great aid in teaching this detail. To quote from Dr. Randall's paper: "The psychology of denture service, I believe to be not the least of several factors to be determined in executing the preliminaries necessary for rendering a prognosis of the case; however, I should, in the main, limit my consideration of this factor to the preparation of the mouth and the patient rather than to the technical procedure to follow." We can better overcome the mental opposition of our patients to dentures by the detail and accuracy of our technic in each step, beginning with the preparation of the mouth at the time of extraction, on through to the finished denture. If we can, by accuracy of technic, interest our patients in our work, we can depend on the patients' cooperation in wearing those dentures, and such cooperation be-

tween the patient and dentist leads to success. To quote again from Dr. Randall's paper: "Having secured a fairly accurate relation of the teeth on the occlusal frame, a detailed study should be made of the physics of the case from a standpoint of the various lines of stress between the superior and inferior arches of the individual case, and as directed toward the crests of the ridges heretofore referred to as the unit areas." A lack of harmony in the various lines of stress or changes resulting from habits of thumb and finger sucking or lack of a proper function of mastication, cause many changes of the face and asymmetrical development. To restore the lines of stress when these patients become edentulous should be our aim. To do that, we must know what constitutes harmonious, symmetrical development and only by the knowledge gained by early teaching and experience can we visualize the degree of correction necessary in each case. We cannot hope to eliminate all developmental defects through dentures, but we should know how to remedy those defects to a degree possible in the individual patient. Condyle changes and resiliency are affected by a change in the occlusion of natural teeth and, in edentulous cases, by the occlusion of the dentures and the resiliency of the basal tissues. Our impression technic should reduce the basal resiliency to a minimum, and our accuracy in establishing facial and anatomic relation, and thereby reestablishing better lines of stress and occlusion should reduce the condyle resiliency. Only through our knowledge of what constitutes proper development, through our accuracy in diagnosis of the degree of change that has taken place up to the time of extraction and our ability to visualize the degree of correction possible in the individual case will we be able to establish a higher percentage of successes. Teaching attention to details in the college with charts such as Dr. Wright's and Dr. Randall's is the surest way to get results.

Dr. Randall (closing): Dr. Farmer stated that the best way to reach our destination was by the shortest and safest route. In dentistry, the shortest way is not the best way. I would like to know how to correct this condition so that the shortest way would be the correct way. We do not want unnecessary problems in the profession, but if we are ever going to get any place with the question of resiliency and its problems, we will have to arrive at some definite method of dividing the sections of the mouth for study and classification. We may not be able to standardize our impressions, but I firmly believe that we can systematize our examination so as to arrive at a correct diagnosis.

FURTHER OBSERVATIONS ON THE DETOXIFICATION OF BACTERIAL TOXINS*

By THOMAS B. HARTZELL, M.D., D.M.D., F.A.C.D., and W. P. LARSON, M.D., Minneapolis, Minnesota

BEFORE the etiologic agents of infection were discovered, practically no progress was made in the way of either the cure or the control of the infectious diseases. The work of Pasteur pointed the way to the solution of this great problem. Lister was the first to profit by Pasteur's teaching, in introducing antiseptic surgery, and from that time began the search for disinfectants, a search that has continued almost unabated to the present time. Disinfectants have their place as well as their limitations. We have today numerous agents that quickly destroy bacteria. It was soon found that most of the active disinfectants could be used only to a limited extent in medical practice, as they were as toxic, in general, to the body as to the micro-organisms.

Aside from two or three agents that act specifically, quinin in malaria, for example, we have no drugs which actually combat bacterial infection when it exists within the tissue structures. The failure adequately to control infections by specific medication led to the search for other means, such as vaccines and specific serums. We know that it is now possible to produce an antitoxin against infections where the micro-organism will secrete its toxin when growing in the test tube, as does the diphtheria bacillus. Only a few bacteria give up their toxin to the laboratory worker, and therefore our antitoxins are few in number; three, to be exact.

In the seventeenth century, a keen physician observed that an attack of cowpox protected against that terrible scourge smallpox, and he introduced vaccination about as we use it today. Prophylactic vaccination against infection in general did not come into use until quite recently. This was, of course, because the science of vaccination was not understood even though practiced to some extent. Scientific control of infections began with the work of Pasteur when he successfully vaccinated against rabies and anthrax. Pasteur recognized the specificity of infections, and the now well understood fact that an attack of some infections was followed by an immunity to that specific infection, and attempted to produce mild forms of infection in order to protect from the more severe forms. As our knowledge of infections grew, it became recognized that we had not, as yet, solved the problem of control, as it was soon observed that many in-

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

fections could not be controlled by either an attack of the disease or vaccination. Pneumococcic and streptococcic infections seem to recur more readily among those who have already had one or more attacks.

There is, then, one type of infection that leaves a permanent immunity, while, in other types, one attack seems to leave the patient more susceptible than before. If one examines the list of diseases that are followed by a lasting immunity, one is struck by the fact that the list is limited to those infections caused by the colon-typhoid group. (We are not including the infections caused by filterable viruses.) Vaccination against these diseases has been found to be successful. The bacteria of this group show a peculiar readiness to grow in a medium of low surface tension. Furthermore, these are the bacteria against which antibodies are readily demonstrated. On the other hand, those bacteria that cause infections which are not followed by an immunity are very sensitive to changes in the surface tension of the medium. Such organisms as the pneumococcus and the streptococcus will not grow if the surface tension of the medium is depressed three or four dynes. In studying this problem with this observation in mind, we have found it to be so common as to be what is tantamount to a law. To state the law concisely: Bacteria that grow well in mediums of low surface tension produce infections that are followed by a lasting immunity, and that may be controlled by artificial vaccination; while those bacteria that are sensitive to changes in the surface tension of the mediums produce infections that are not followed by immunity and that cannot be controlled by artificial immunization.

The most plausible explanation of this phenomenon is the fact that antibodies, in order to be effective against their specific bacteria, must be able to attack them. It has been shown experimentally by Greenfield and one of us (W. P. L.) that bacteria may be so changed in physical composition that they do not readily unite with their antibodies. Such bacteria may then be brought back to normal by cultivation under suitable conditions.

Inability of the bacterium to unite with its specific antibody is sometimes spoken of as the condition of "serum-fastness." It has been observed especially with the typhoid bacillus that it is often serum-fast until after it has been cultivated on artificial mediums for several generations. During the course of the infection, it becomes necessary for the micro-organism to establish itself in such a way as to resist attack by its specific antibodies. This factor determines whether or not an infection is to proceed or to subside. As has been pointed out above, pathogenic bacteria may be divided into two main classes: those that grow well in a medium of low surface tension, and those that are unable to develop in a medium the surface tension of which has been depressed two or three dynes below the optimum of about 60 dynes. This view is in harmony with our observation that practically no antibodies may be demonstrated against the bacteria that are sensitive to surface tension changes, since the antibodies are unable to unite with these bacteria. Undoubtedly, because of the physical condition of the ectoplasm, no antibodies are demonstrable; and since the antibodies cannot attack the bacteria, they have no influence on their growth and development. Here, then, we have an explanation as

to why some infections are followed by immunity, while, in other infections, the patient seems to be as sensitive, if not more so, after withstanding the infection.

We have studied the effect of surface tension depressants on the pathogenicity and toxicity of some of the surface tension sensitive organisms, especially the streptococcus and pneumococcus, as well as various bacterial toxins. We have made the interesting observation that the streptococci and pneumococci completely lose their powers to infect after being in contact for a few seconds with a surface tension depressant such as castor oil soap. We have found that a 1 per cent solution of castor oil soap will deprive the pneumococcus and streptococcus of their pathogenicity in half a minute. Animals such as white mice and rabbits, which are very sensitive to pneumococcic and streptococcic infections, will withstand many thousand fatal doses after the respective organisms have been treated with castor oil soap.

This surface tension depressant not only deprives the bacteria of their infective properties, but it also neutralizes the toxins, both soluble and endotoxins, of the bacteria. During the past two or three years, it has been found that the scarlet fever streptococcus secretes a potent soluble toxin. Some investigators have found that one one hundred-thousandth cubic centimeter of this toxin, when injected into the skin of an individual, causes an erythema and that one one-thousandth cubic centimeter when injected into an individual, will often cause the typical picture of scarlet fever. When this toxin is mixed with castor oil soap and immediately injected into an individual, we find that one thousand times as much may be injected without causing any symptoms whatever. We cite this as an example of the marvelous detoxifying properties of the castor oil soap. We have found it practical to detoxify both the bacteria and their toxins by this method for purposes of immunization.

One of the greatest difficulties in immunizing animals against the various bacteria and their products, up to the present time, has been the fact that if these antigens were injected in an unmodified state, they would cause infection and often the death of the animal. When sublethal doses are given for purposes of immunization, the toxicity of the antigen alters the power of the animal body to react in the way of antibody formation, so that immunization is slow and often impossible. By injecting the animals with bacterial cultures that have been detoxified with castor oil soap, we rapidly produce immunization. We find it comparatively easy to produce potent serums against both pneumococcic and streptococcic infections. The immunization is rapid, since tremendous doses may be given without injurious effects; and since no injury follows the injection, no time is required for recuperation, as is the case by the other method. We find this a practical method of immunizing against the various bacterial toxins, such as diphtheritic toxin and scarlet fever toxin.

It has been customary up to the present, in immunizing against diphtheria, to neutralize the toxin with antitoxin; that is, horse serum that contains antibody against the diphtheritic toxin. The patients are injected at ten-day intervals; in all, three or sometimes more injections being given. The disadvantage of this method lies in the fact that the individual becomes sensitized to

horse serum, a great liability to a patient in case it should be necessary at some subsequent date to use antitoxin prepared from the horse. By detoxifying the diphtheritic toxin with castor oil soap, no such sensitization follows. A further advantage is the fact that the immunization may, as a rule, be accomplished with a single injection instead of three injections, a point of very great importance in general practice.

What has been said of diphtheritic toxin also applies to the scarlet fever toxin. By detoxifying the toxin with castor oil soap, a thousand times the usual dose may be given and, as a result, immunization is effected in a few days.

We cite our experience with these toxins in order to emphasize the practicability of detoxifying in this way.

The mechanism of detoxification is of great interest. Early in our work, it seemed that it was closely associated with the phenomenon of surface tension, as the maximum results were obtained within certain limits where the surface tension depression was greatest. Extensive investigation on this point has led us to the conclusion that it is an adsorption phenomenon, as the detoxification follows definitely the laws of adsorption. If a quantity of charcoal, colloidal soap or starch is added to a mixture of soap toxin, we find that the detoxification does not proceed as when these substances have not been added. The explanation of this lies in the fact that the small particles adsorb the soap onto their surfaces, and hence the soap is not free to react with the toxin molecules. This and other experiments have led us to the conclusion that the toxin molecules, which are of greater dimensions than the castor oil soap molecules, as evidenced by filtration and dialyzing experiments, adsorb the soap onto their surfaces, and, in that way, become isolated or imprisoned, and hence are not free to exert their toxic action in the usual way when injected into animals.

In accordance with well know physical laws, not all of the toxin would be adsorbed at a given moment, but a small fraction will remain free, and an equilibrium is thus established between the bound and the free toxin. As the free toxin is slowly taken up by the body tissues, an equivalent amount of the bound toxin is set free in order to maintain the equilibrium, and, in this way, the toxin is slowly fed to the organism at such a rate as not to cause intoxication but rather immunization. When the toxin soap mixture given has been excessive, it is clear, from what has just been stated, that there will be a larger amount of free toxin present and therefore it is possible to intoxicate with a so-called neutralized mixture.

The principle of adsorption is one that must be borne in mind if the castor oil soap is to be used to detoxify bacteria or toxins in the mouth. Because of its somewhat unpleasant taste, it is not practicable to use a pure solution of castor oil soap. It is necessary to mix it with certain substances that have the ability to cover the taste. Therefore, in making such a preparation, one must bear in mind the necessity of having the castor oil soap in such proportions that it will not all be adsorbed onto the ingredients with which it may be mixed. There must always be some soap in excess of what would be adsorbed onto the surfaces of such substances.

WHY FILL CANALS?*

By W. A. CHAMBERLAIN, D.D.S., St. Louis, Missouri

IT is apparent to many and it is logical to assume that the perfect filling of a canal is only accidental and infrequent. If such is the case, and the underfilling of a canal is more desirable than the overfilling, where is the line between a perfect canal filling and no canal filling? Theoretically, if the filling does not seal the apical foramen and leaves an unfilled space of 1, 2 or 3 mm., would it change the condition to increase the unfilled portion to 6, 8 or 10 mm.? Is the purpose of the canal filling to plug the canal, or is it just to meet radiographic requirements? Just what does a canal filling accomplish? Has it been proved that it is necessary to fill perfectly or sterilize a canal? Because clinical observations show that underfilled canals are more satisfactory than overfilled ones,[1] and because of a desire to avoid periapical tissue injury by underfilling, many are beginning to ask, why fill canals?[2] or where is the filling limit? or what factor in controlling reinfection is a canal filling? These are all very natural questions when considering the difficulties of a canal operation. In addition, there is the fact that the average practitioner must consider the economic part of the work.

The preparation of the canal alone for the filling is a time-consuming procedure,[3] taxing the physical and mental being of the operator and patient with the numerous radiograms of measurement, wires, test cones and completed fillings, which may or may not require reworking. Waiting for film development seems long. Impatience, which is hard to control at times, may lead to hurry and to one wrong move that destroys the possibilities for a satisfactory outcome. All cannot be specialists, whose equipment and assistants and routine technic are developed to a higher degree than the average practitioner's, assuring better results in a shorter time. All would be glad to dispense with the present method of canal filling, if it is not necessary, and all are interested in some simple and more positive technic. All realize the weakness of the apex of a pulpless tooth, around which the investigations of the profession, research workers, histologists and pathologists have centered. All of us

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 23, 1925.

1. Coolidge, E. D.: Unpublished data.

2. Webster, A. E.: Dominion Dent. J., 23: 318, 1911.

3. Black, G. V.: A Work on Special Dental Pathology, Chicago: Medico-Dental Publishing Co., 1915; p. 287.

know that the ideal canal filling is the pulp itself and that much has been done to use it *in situ* by a process of fixation. So far failure has been the result. All of us are familiar with cases in which satisfactory conditions exist clinically and radiographically with partial and incomplete canal fillings. We are also familiar with cases in which teeth have been left for long periods of time, carrying fillings which, when removed, were not dripping with fluids but were comparatively dry, still retaining the odor of the antiseptic, and in a satisfactory condition clinically; and we wonder why, when we read the exhaustive reports about the impossibility of sterilizing a canal and consider the mild drugs which are advocated in treatment.

From the very beginning of canal operations, a generation or two ago, it was the conception of operators, as it has been until recently, that all the organic tissue must be removed from the canal and be replaced with filling material. This conception has seemed so self-evident that no doubt has developed regarding it. The same difficulties were met in early times that are met today. Papers were read and discussions held on "Fang Filling or No Fang Filling" and the question was raised which again is raised in this paper: Is a canal filling necessary, provided the canal is sterile and perfectly sealed at the coronal end, and, if so, what is accomplished by the filling?

It is obvious that any theoretical conclusions which may be drawn from such a consideration must be checked up by laboratory and research work. This I have not done, but I have endeavored to gather evidence from the whole field of dental science to support my views.

It has been hard to overcome that natural inclination to attempt to remove all of the organic tissue from the canals and replace it with some filling material because of the idea that fluids would fill the canal if it were not perfectly plugged. Every known physiochemical method has been tried. Everything of a usable nature has been pushed into canals as a filling material in an attempt to find something suitable: wood, cotton, lead, copper, iron, silver, plaster of Paris, cement, amalgam, paraffin, pastes, gold and guttapercha; theoretically, for the purpose of obliterating the canals and sealing all openings against the entrance of fluids.

It is easy to follow the trend of effort in canal operations by the advance in scientific knowledge. Root histology has shown that, because of the many accessory canals and multiple foramina, mechanical removal of organic tissue from canals is impossible. This will be recognized as axiomatic, if any study has been given to root anatomy.

Some canals are inaccessible. It has been shown that normally there are[4] two canals in the mesiobuccal root of most of the first and second molars, one of which is never opened. Radiographically, one is superimposed on the other. Not considering the multiple foramina, which, according to some, have been taken too seriously because, as time goes on, many are closed and covered by new layers of cementum,[5] there are accessory canals of considerable size and in such a relation to the trunk canal that no mechanical removal of contents would be possible. Accepting this evi-

4. Orton, F. H.: General Improvement of Technic in Crown and Bridge Work, J.N.D.A., 6: 91 (Feb.) 1919.

5. Noyes, F. B.: Structural Characteristics of Region of Root Apex, J.N.D.A., 8: 18 (Jan.) 1921.

dent condition, chemical removal was introduced.[6] Sodium potassium alloy proved the most effective and was used extensively. Sulphuric acid has also been used by sealing it in the canals and depending on diffusion to carry it into all recesses. Those who used these agents felt that all channels, including part of the dentinal tubules, were open and clean.

The filling of such a root meant that some fluid material must be used. Chloropercha was adopted and pumped into the canal. Pressure necessary to force it into the smaller foramen forced quantities through the root end of larger ones. Protrusion and encapsulation resulted. Both have been attacked and defended, until the concensus of opinion now prevails that underfilling is more desirable. This opinion, of course, excludes the theory that led to protrusion: that all organic contents must be removed and replaced by a filling. This is based on clinical observation and a desire to avoid periapical tissue injury, without attempting to explain just why. Underfilling is also supported by a realization that no filling ever fills a canal perfectly except by accident and that uninjured apical tissue will be more favorable to many protective changes which will take place.

To approach the filling of a canal with the conception that all formina, accessory canals, mouths of dentinal tubules and trunk canals must be filled only leads to the use of the rosin-chloroform method, which it has been proved repeatedly does not accomplish such a thing, except by accident and that infrequently. The better methods of filling canals do not attempt so much, and therefore are more apt to produce a better filling of greater density and unchanging properties. To know just why an underfilled canal is the more satisfactory will help one to learn just where the filling limit exists. In my opinion, it is dependent on seepage of fluids into the canals, either through the apical foramen or through the tooth structure; for it is my belief that success in a canal operation is dependent on the prevention and suppression of bacteria within the root and suppression of the escape of toxins formed by the action of autogenous enzymes[7] on contents of tubules after pulp removal. To what else could it be due? The great cry through all time since those dark days when we were told and shown by the roentgen ray that we were not accomplishing what we thought we were in our canal operations has been "infection." Our agony has revolved around infection and reinfection of the minute apical openings, which might be microscopic yet harbor a colony of bacteria; those crater-like foramen with the construction rootwise from the root surface; that exposed apical cementum with its lacunae and canaliculi inviting bacteria; those accessory canals defying mechanical treatment.

Even if the root structure cannot be sterilized[8] and bacteria are left in the

6. Rhein, M. L.: J. Dent. Res., 4: 327, 1922.

7. Noyes. Footnote 5, page 20. Price, W. A.: Physical Properties of Root Filling Materials and the Efficiency of Root Fillings for Blocking Infection from Sterile Tooth Structures, J.N.D.A., 5: 1269 (Dec.) 1918.

8. Price, W. A.: Dental Infections Oral and Systemic, Vol. 1, p. 184.

canals or gain entrance by the blood route, these organisms are dependent on a fresh supply of fluids, or they will destroy themselves by their own products or remain inactive. The diffusion of toxins is also dependent on a change of fluids.[9] It must be noted that fluids can pass both ways through the dentin and cementum, but bacteria cannot pass either way. Their coming and going must be through the foramen or pulp chamber. At that, bacteria have not the property of locomotion, so, if they would gain entrance to a canal, they must ride in with a flow of fluids. The presence of bacteria does not mean infection.[10] That term becomes applicable only when bacteria multiply and overwhelm the tissues. The presence of diphtheria germs in the mouth or throat does not necessarily mean diphtheria. Bacteria in the apex of a canal depend on some force to carry them into the periapical tissues. If there is a supply of fluid, the germs will not only develop virulence but will also be carried into the tissues. If the defense of the tissue is sufficient, then no infection takes place.

In the filling of coronal cavities, it is known that all infected tooth structure cannot be cut away, yet the presence of bacteria in the tubuli have not undermined our fillings, evidently for the reason that there is not sufficient change of fluids to support their existence. The customary explanation is that they are entrapped.[11] Photomicrographs of tooth structure show bacteria in the tubules some distance from the so-called decay. The same, no doubt, is true of canal fillings. Voids occurring at the end of a dowel, due to insufficient cementation, remain as such and do not become filled with fluids from the dentinal tubules. Dentists have the natural conception that voids in canals will fill up with fluids, but do they always fill up where there is no infection to cause inflammation exudation or suppuration?

The greatest need in a canal filling is to seal the ends of the trunk canal, and, of the two ends, the coronal is the more important because of the positive and certain inflow of fluids and bacteria. How much inflow of fluids will come through the apical foramen is doubtful while the periapical tissues are free from the assaults and invasion of bacteria and toxins by force, irritation or increasing osmotic pressure. The force referred to is that caused by mastication where the pulp chamber opens into an unfilled cavity; or due to any accidental or gas pressure; all of which is easy to understand. By osmotic pressure we mean that condition brought about by the action of bacteria, toxins or enzymes where the laws of osmosis produce a change of fluids by virtue of contact and difference in specific gravity. This may be hard to visualize, but there has to be some physical or chemical reason for the beginning of the assault because bacteria cannot initiate an attack. There has to be some physical or chem-

9. Bunting, R. W.: The Tooth, a Permeable Membrane, J.N.D.A., 5: 519 (May) 1918.

10. Crane, A. B.: Dent. Cosmos, 65: 270 (March) 1923.

11. Price: Footnote 8, p. 217. Howe, P. R.: Dent. Cosmos, 59: 893 (Sept.) 1917.

ical irritation to the soft tissue to produce an escape of fluid. The contact of a fluid in the canal with the periapical tissue of different osmotic pressure might be sufficient to start an ebb and flow of fluids into the canal. What carries bacteria into tissue? Is it not force? After that, what accounts for the migration of the bacteria? Is it not the change of fluids in the tissue? Bacteria are like seeds that have to be carried about and planted by some external force.

When the bacteria have been destroyed in infected teeth through proper treatment, and the periapical tissue has healed and recovered, there may be a diffusion of fluids but not a flow nor seepage. At least, a vicious cycle has ceased. In teeth from which vital pulps have been removed, vital tissue remains in accessory canals and apical foramen, and continues as such, provided, of course, the operation has been done properly.

The perfect filling then should fill the canal to its full diameter, seal it at the apical dentinocemental junction and seal the walls and coronal end, so as to remove all voids and spaces by a solid, insoluble, impervious unchanging mass, on the theory that spaces left will become ponds of fluid, which will invite reinfection. It is known that a canal cannot be filled perfectly except accidentally, and that infrequently, and it has been observed that an underfilled canal is more favorable than an overfilled one. It is furthermore the concensus of opinion of the dental and medical professions that pulpless teeth can be safely retained by proper treatment.

If infection in canals is suppressed or overcome by our present methods of treatment and canal filling, and a satisfactory condition is maintained, several things must be responsible, the principal one of which must be the amount of fluids circulating within the canal, and the other factors no doubt have to do indirectly with control or limit of that supply.

It also has been observed[12] that an ingrowth of soft tissue extending to a considerable distance into the unfilled part of canals of teeth from which the vital pulp has been removed takes place even to the extent of filling spaces left around a canal point.[13] This is part of the process of natural closure of the apical foramen, with scar tissue, osteoid deposits or cementum. Granulation tissue continues to grow until limited by some factor, after which it shrinks, forming scar tissue. When granulation tissue occurs on the body surface, it will continue to grow until limited by a covering of epithelium. It then shrinks, forming scar tissue. If the area of granulation is large, skin must be grafted on it, or the tissue will keep on growing and have to be cut away. Nutrition may limit its growth in canals, and bring about a scar.

The diffusion of fluids at the apex no doubt is reduced by the conglomerate histologic structure[14] of the tissue normally, and in the presence of inflammation by a protective change of the root end to a hyaline formation, in which case the tubules and channels are oblit-

12. Barrett, T. J.: Dent. Cosmos, 67: 589-591 (June) 1925.

13. Leigh, R. W.: J. Dent. Res., 5: 228 (Dec.) 1923.

14. Thomas, N. G.: Formation of Apices of Teeth, J.N.D.A., 8: 15 (Jan.) 1921.

erated. A deposit of cementum closes some foramina, scar tissue others. Another factor is the property of the tissue surrounding the tooth for toleration, protection, defense and resistance. Just how much toleration of tissues is demanded by the average properly treated and filled pulpless tooth can be worked out by research, but clinical observation shows that it is not overwhelming. Medication, instrumentation, the presence of débris and the coagulation of proteins may help to plug openings and prevent an inflow of fluids, but possibly only temporarily, until some more constructive change takes place. With the pulp gone, doesn't the periapical tissue undergo a metaplasia in an effort to adapt itself to external conditions? The reason any canal remains satisfactorily filled or unfilled is because of a lack of fluids circulating within the canal.

CONCLUSION

Because of certain favorable conditions controlling diffusion within a tooth, there may be some teeth that would require no fillings; nevertheless, I would say that a canal filling is necessary in a pulpless tooth, and that the limit for a canal filling is determined by the amount of inflow of fluids in that particular tooth; and since it is not possible to determine what it will be, it is therefore desirable and advisable to work toward the ideal canal filling, reducing as much as possible by the filling itself the amount of diffusion of fluids through the dentinal tubules, and apical foramen, as well as the coronal end, whether the tooth has been infected or whether it is one from which the vital pulp has just been removed.

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DISCUSSION

J. R. Blayney, Chicago, Ill.: Dr. Chamberlain's paper sounds a note of warning that is very timely. Only a few years ago, most operators thoroughly believed that all root canals should be overfilled, but today, after a careful check of clinical cases and reflection on the advantages and disadvantages of such a procedure, most operators are in favor of an underfilling. The question was raised as to whether it is necessary to fill a root canal at all if an underfilling is better than an overfilling. It is in reply to this query that Dr. Chamberlain has sounded his note of warning. We are liable to go to extremes, and extremes are always dangerous; for example, following Hunter's denunciation of all pulpless teeth, the pendulum swung to the limit, but today it is coming to rest somewhere near the center of the path. This is the very situation that we should try to avoid during the reaction following the period of overfilling. True, an underfilling is to be more desired than an overfilling, but we should be very careful not to be satisfied with any kind of an underfilling. It is too easy to follow the lines of least resistance. The question was asked as to what determines the apical limits of a perfect root canal filling. In answering this question, several factors must be taken into consideration; namely, the pathologic condition of the pulp and the periapical tissue at the time treatment was instituted, and the size, the shape and the general direction of the canal. When a vital pulp has been exposed by caries, and consequently infected, the point of amputation in the removal of this pulp must be somewhere apically to the area that would show microscopic changes, if it were possible to examine that pulp under the microscope. Certainly that is very difficult to determine clinically; therefore, a sane rule to follow is to amputate the pulp in the region of the dentinocemental junction in the large and accessible canals, and in those small tortuous inaccessible canals, to amputate the pulp as far apically as we can reach by mechanical means. After amputation of the pulp, and in attempting to fill the root-canal, the filling should be inserted into the canal close to the point of amputation, but care should be used that the filling material does not produce pressure on the

remaining vital tissue. The guttapercha should also completely fill the full diameter of the canal at its apical end. We should constantly remember that true pulp tissue ends at the dentinocemental junction and does not extend to the tip end of the root. Dr. Chamberlain has cited cases with underfilled canals having root-ends that are normal radiographically, and that contain no fluid when the canal is open. In the cases of this type that I have been able to examine microscopically, I have found vital tissue; and why does vital tissue remain in the canal? Because, during the treatment, this tissue was not subjected to additional mechanical trauma, or bacterial or chemical irritation. In the treatment of a case containing a necrotic or gangrenous pulp, after curettement and medication of the canal, we should strive to place our filling so that the inner ends of the dentinal tubules are sealed, particularly along the principal canal. It is the bacteria in the depths of the tubular dentin that materially favor development of reinfection. Again, in cases of this type, we should strive to carry the filling material only to the dentinocemental junction. Expressing that conversely, the membrane that lines the portion of the canal, which is formed entirely by cementum is not pulp tissue, but forms an invagination of the periodontal membrane, and surely this tissue should not be subjected to additional irritation from the filling materials. To me, the presence of a fluid in a root canal, provided the coronal end of the canal is sealed, can be explained by the causes of local edemas elsewhere in the body. The etiologic factors of the edemas are many, but the one with which we are chiefly concerned is an increased permeability of the capillary walls, which may result from an excessive amount of trauma, irritation from bacterial toxins or the excessive use of drugs. In the treatment of root-canals we should strive to reduce this mechanical trauma, and this chemical irritation to the very minimum, thereby reducing edema to the minimum.

Milton J. Waas, Camden, N. J.: The paper to which you have just listened by Dr. Chamberlain contains a most curious phenomenon. He has started out by listing all the reasons why this question, which he has propounded, should be answered in the negative and after a most careful review of the subject and "the whole field of dental science as published to support these views," as he puts it, he has, in the last paragraph, been driven to giving a most convincing positive answer. I am quoting a part of his last sentence. "It is therefore desirable and advisable to work toward the ideal canal filling whether the tooth has been infected or whether it is one from which the vital pulp has just been removed." Could an answer be more positive than this? In considering how a canal should be filled, we must divide our cases into two great groups: those with and those without demonstrable periapical tissue destruction. In the cases without periapical disturbance, we should cause the irreducible minimum of tissue injury mechanically and chemically both in the pulp removal and in the canal filling, the latter of which should obliterate all space exactly to the apical dentinocemental junction. Bearing in mind Groves' histologic sections on this point, in the cases with periapical disturbance the roots must be opened through the extreme apex that we may obtain drainage, if necessary, and access for treatment of the area either by ionization or other methods of choice. Our canal filling in these cases is in accordance with the cemental condition. If the cementum is denuded, the canal should be overfilled so that the denuded portion may be encapsulated. Denudation of the cementum is always an invitation to osteoclastic action. Osteoclasts can, and often do, attack a denuded cemental area even though it may have been sterilized. They cannot, however, attack guttapercha. Many overfilled canals have shown up poorly in the past because strict asepsis was not observed. From this fear of injury to the periapical tissues in this class of cases, one might think them different in their vital reactions to all other parts of the body, whereas they are subject to the same physiologic phenomena of repair as other human tissues, when the balance is rendered in favor of the host. Cases of proper overfilling result in an entire clearing up of the infection and the production of a new unbroken lamina dura, Cryer's article,[15] has completely revolutionized our conception of the wonderful bone

15. Cryer, M. H.: Dent. Cosmos, 58: 861 (Aug.) 1916.

regeneration that takes place when conditions are rendered favorable for its progress. Moreover, the modern well equipped root-canal operator can consistently fill the great majority of all canals perfectly, including those with side sprigs and multiforminal openings. In fact, this performance is so consistent that we are much surprised if we occasionally find a film showing either underfilling or overfilling, unless the latter is intentional. The arguments of Dr. Chamberlain that it is time consuming and taxing to the physical and mental well being of the operator, and that there is a lack of commensurate recompense, etc., cannot be allowed. Impatience has no place in this work, and if the average practitioner cannot accomplish this work satisfactorily, it is time it should be made a separate branch of operative practice, as is orthodontia. We must bear in mind that two conditions are always in force in our work: the resistance of the host, and the virulence of the infection. These must have a major consideration in diagnosis and prognosis. Too many papers by root canal operators lay emphasis only on the technic of the work. Diagnosis is of equal importance, and the two, diagnosis and technic, are inextricably intertwined. Any appeal for us to insert less than the ideal canal fillings will in the long run prove futile. "Low aim, not failure is crime."

Malvern D. Huff, Atlanta, Ga.: It was with a natural feeling of disappointment that I heard our distinguished essayist raise this question "why fill root canals," and apparently answer in the negative until just the last minute, stating that the successful root canal filling was an accident, rather than the rule, particularly in view of the fact that the ability to fill root canals completely has been shown before this body as being the rule and not the exception, at the last three or four meetings of the Association, by men who have, in the last seven years, been doing research work in this connection. The Atlanta Clinic Club has given clinics all over this country demonstrating that it is possible to make proper root canal fillings by the diffusion method, using an inert and harmless material, which does prove, as was clearly shown on slides, that we have filled them not accidentally but scientifically, and had regeneration of tissue follow in six months to a year, depending on the amount of tissue which had to be destroyed. Two things cannot occupy the same space at the same time, and if I "get there first" with a sterile root canal filling, I prevent the entrance of bacteria and the accumulation of fluid in that canal. Some of us at least are going to "carry on," until there will be no doubt in the minds of any that a proper filling material which fills the root, not necessarily overfills but certainly does not underfill, is what we are going to strive for and attain.

A. J. Cottrell, Knoxville, Tenn.: I know how beautifully Dr. Huff fills root canals, and I have no doubt that Dr. Chamberlain can take from his practice, slides showing well filled root canals; I have no doubt that he can produce from his own records beautiful roentgen-ray demonstrations, but to my mind and to Dr. Chamberlain's mind, great damage has been done by overfilling root canals, and the point that Dr. Chamberlain wishes to make is that, since, in the minds of many, it is harmful to overfill root canals, there is a danger of underfilling them to a great degree—there is a danger of not attaining the ideal. Much allowance must be made for slides. The overfilled root canal does not in a great many instances show a complete bone regeneration and a reproduction of the lamina dura. I wish to endorse the plea for a cessation of this once-held-good practice of overfilling root canals, and attempting to produce a bone regeneration, because, while Dr. Huff has just said that bacteria will not attack guttapercha, guttapercha will certainly prevent an excellent bone reproduction. There are many in the profession who believe that overfilled root canals are a great disadvantage.

Edgar H. Keys, St. Louis, Mo.: I have known Dr. Chamberlain about ten years and I know that he has given an amazing amount of time and work to this phase of dental surgery. The insinuation that he would follow the lines of least resistance is erroneous. I have seen hundreds of slides made by Dr. Chamberlain that were just as beautiful as those of Dr. Waas, and yet he admits that there are some root canals that cannot be filled. It is most remarkable to say that there are no teeth that come to any practice that cannot be filled.

John V. Conzett, Dubuque, Iowa: We might clarify this whole proposition if we were to classify the various conditions we meet. We can't fill all root canals in the same way; we don't want to fill all root canals in the same way; we wouldn't fill a sterile canal as we would fill a canal that had been putrescent or as we would fill one that had a denuded root area. I am sure Dr. Chamberlain wouldn't attempt to underfill a canal that had been opened to the apex or beyond. The whole situation would be clarified if we could have the proper classification. I did present such a classification in California two years ago, and recently in Chicago, before the Odontographic Society.[16] In some of those cases, I do not attempt to fill the apex, because we have healthy cemental tissue at that point, and we want that cemental tissue to function. In other cases, we do not have that help, and then we want to fill to the apex, but rarely do I wish to fill beyond the apex. Of course, if I felt sure I could mushroom over these cases perfectly, then I would be glad to do it, but I confess that I have never been able, to my satisfaction, to perfectly mushroom over the denuded areas. A denuded area of cementum is a dangerous area always. There are cases in which I attempt to save those teeth, but if that area is decidedly dangerous, I confess that I would rather have it out of the mouth than in it.

Dr. Chamberlain (closing): I have supposed that all were agreed on the impossibility of perfectly filling a canal in view of the research which has been done on root anatomy and the physical properties of filling materials; therefore I am a little disappointed with the manner in which the discussers have failed to discuss my paper or to advance any explanation as to why an underfilled canal is more satisfactory than an overfilled one. My paper may be considered a theoretical consideration of canal filling. The real point I wanted to bring out was an explanation for a canal filling since it seems the reasons we have had are incorrect and unsatisfactory. Dr. Waas gave radiographic evidence that he had perfectly filled root canals, showing a molar with some accessory canals filled. The radiogram indicated very plainly that the filling material was fluid and had been pumped into the canal because of the large amount which had been forced through the root end. Can there be any doubt about the physical shrinkage which takes place with the evaporation of the solvent? Furthermore, does he know whether he filled all of the accessory canals in that tooth, or does he know whether there were twenty more that he did not fill? Why should he take radiographic evidence for a microscopic result? In the beginning of my paper, I ask the question "Do we fill a canal for radiographic reasons or do we fill for the purpose of removing all voids to prevent an inflow of fluids?" I do not think we ever fill canals perfectly except accidentally, and I think that the reason the condition of canal fillings or pulpless teeth remains satisfactory is because there is no circulation of fluids within the canal. Dr. Conzett said that it would take us all day to discuss all the ramifications of this consideration, and he is right. To discuss the physical properties of a filling material alone would take us all day, and you are all familiar with the work that Dr. Price has done on the physical properties of filling material, in showing that they do not accomplish the purpose for which they are used. Dr. Price published a very elaborate report on work done, showing the impossibility of sterilizing tooth structure; yet we know that teeth that have been infected are treated with mild antiseptics and filled according to the present method of filling and they remain in satisfactory condition. Now what is the answer? As Dr. Black said in this section yesterday, it is going to require the work of a great many capable research workers in various branches of medicine and science to be able to give a satisfactory answer.

16. Conzett, J. V.: Root Canal Problem, J.A.D.A., 13: 190 (Feb.) 1926.

MEDICINE AND DENTISTRY*

By HENRY S. PRITCHETT,† New York City

I ALWAYS feel a certain hesitation in speaking to a group of highly trained practitioners of medicine or dentistry. An address under such circumstances seems to assume that I have knowledge of medicine or of dentistry. As a matter of fact I have a wide acquaintance with physicians and with dentists, but I am entirely innocent of any technical knowledge of either medicine or dentistry.

REPORTS OF CARNEGIE FOUNDATION

The reports which the Carnegie Foundation has brought out concerning medical education, and the report that is about to be issued by it on dental education, have to do, not with the practice of either subject but with education for medicine and for dentistry. The Carnegie Foundation has assumed the right to speak only about education, not about the technical practice of either medicine or dentistry.

It is an encouraging indication of our progress that physicians and dentists are meeting together for their common interest. The diseases of the eye, ear, nose and throat are everywhere included in the practice of conventional medicine. In Canada and the United States, the disorders of the teeth have been allotted to dentistry, which has been organized and is now legally defined as a division of the healing art, different from a specialty of medicine. It is perfectly clear that dentistry is a form of health service that must be made an oral specialty of medicine or the equivalent thereto. That physicians and dentists are meeting together to consider their common problems is a hopeful sign that both groups realize that these two professions are not separate and distinct agencies but two parts of a common health service to humanity.

Before I go further, I wish to express my appreciation of the kind resolution you have just adopted with respect to the reports of the Carnegie Foundation on medical and dental education. The Foundation has endeavored to do this work, as I have already said, from the standpoint of education, not from the standpoint of technical training. The reports, however, will be of value only as they may commend themselves to those who teach and to those who practice in medicine and in dentistry.

RESEARCH

I venture also to say a word touching the research group of which Dr. Simonton, who has just addressed you, is the leader. This is a research in the field

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†President of the Carnegie Foundation for the Advancement of Teaching.

of oral hygiene carried on primarily by dentists but with the cooperation of clinicians, pathologists, bacteriologists, physiologic chemists and of other investigators, who approach the problem through their various fields of research. It is the hope of this group that, in attacking the problem of pyorrhea through these converging lines of investigation, there may be discovered, in time, facts that will throw light both on the etiology and the treatment of this disease, so prevalent among all mankind. This form of group organization in research has commended itself to the Carnegie Foundation and to the Carnegie Corporation as a promising method to attack highly complex questions of the public health and of disease. In any such organization, it is essential that some one man shall furnish the driving energy and the coordinating spirit.

In this particular research, the Carnegie Corporation instituted a new feature. It appointed a small advisory committee whose function it is to confer with the research group once or twice a year, giving the benefit of their advice as to methods and results. The advisory committee, in the investigation on pyorrhea, includes William C. Ophuls, pathologist at Stanford University; Charles P. Lipman, bacteriologist and physiologic chemist in the Agricultural College of the University of California, and H. Jerome Allen, of Santa Barbara, as a representative of the dental profession. The advisory committee, therefore, represents converging points of view somewhat as does the research group itself. The day has gone by when these great problems of human disease are likely to be worked out by a single investigator even though he may throw great light on the problem. Such research is a cooperative effort in which good organization and coordination of the study of many men must play their part.

EDUCATION

I may add one other word with respect to the nature of these studies in medicine and in dentistry carried out by the Carnegie Foundation, and that is that, in conformity with the conception that the Foundation was doing a work in education, not a work in the technical practice of medicine or dentistry, the reports have been prepared, under the direction of the president of the Foundation, by men who were not practitioners either of medicine or of dentistry but who were primarily authorities in education. This was a necessary consequence of the whole theory upon which the reports were made, namely, that they were reports in education, not reports in technical practice or science.

There is another important reason why these studies in medical and dental education should be made by one familiar with educational work rather than by a physician or a dentist. This reason lies in the fact that professional education in medicine, in law, in dentistry, in any technical vocation, is an education imposed upon cultural preparation obtained in the secondary school, and in the college. Professional education is not a separate and distinct thing but a part of the whole education which the boy and the man receives through the elementary school, the high school, the college and the professional school. No professional school can hope to turn out skilful men for the practice of its particular profession unless it can receive from the high school, and from the college, men who have been educated to use their minds. The profes-

sional student, before he comes to the medical or dental school must have formed the habits and developed the power of his mind if he is ever to be more than a routine practitioner in his profession. For this reason, it is necessary that the man who reports on medical or dental education shall be familiar with the whole machinery of education through which the medical or dental candidate is prepared for his professional study.

Since the reports of the Carnegie Foundation on medical education were issued, there has been an enormous improvement in medical training and the requirements for medical education, not only in our own country but also in most other countries of the world.

It still remains true that the young American who enters the medical school, even after his two years of college, is not so soundly trained in certain fundamental subjects, for example, his own language, as is the English, the French or the German of similar age entering the medical school of his own country. Furthermore, we put our American medical students into the medical schools at an age two years beyond that at which the medical students of European countries begin their professional training.

This is due, first, to the fact that we have a three-storied educational structure, consisting of elementary school, high school and college, which underlies the professional school. In Europe, the elementary and the secondary school are the only agencies of preparation for professional students.

In the second place, our secondary schools and colleges have been going through a twenty-five year period of inflation. Courses have been multiplied to include every subject of human interest, and both the high school and the college offer courses of study so numerous, so unrelated, so diverse in their educational value that the youth who completes a chosen series of studies often fails to acquire the ability to master any subject thoroughly. He comes from the high school and the college with the conception that education consists of the acquiring of information, rather than that it is a process for training the habits and the powers of the mind. In consequence, he often has slovenly intellectual habits and his mental powers are undeveloped. He has been stuffed with a little knowledge in many things.

The great improvement likely to come to medical education in our country in the next twenty years will consist in a reform of the system of public instruction in such fashion that the education the schools and colleges give shall be more simple, more sincere and more thorough. Under such a process, also, the youth should be ready for his medical school at least two years earlier than he is today. The young man who graduates from college at 22 and then spends four years in the medical school and two years as an intern, is nearly 30 before he has entered practice. This situation is not only unjust to the individual in the matter of expense and of time, but, in addition, a man in a technical profession, whether of medicine, of law, of engineering or any other subject, loses a certain elasticity if he spends too many years in the relation of a pupil.

I turn now to speak more particularly of the profession of dentistry.

EARLY PRACTICE OF DENTISTRY

The practice of dentistry, a hundred years ago, in our country, was a mechanical trade. Similarly, a little

earlier, the practice of surgery was, in many cases, in the hands of a barber. I have here a facsimile of a letter written to General Washington in 1798 by the man who made for him those fearful and wonderful machines that he used in his mouth for many years, having lost his teeth from pyorrhea at a relatively early age. The letter is evidently that of an illiterate man. He describes two "setts" of teeth that he is returning to General Washington. He writes that one "sett" was very black, "caused either by your soaking them in port wine or by your drinking it." He advises Washington strongly against the use of port wine because it is "sower" and has a tendency to blacken the teeth. This conscientious mechanic also gives minute directions for repairing holes in the sealing wax and for providing against other accidents. He ends by stating that his charge will be $15.00.

The letter is interesting as throwing a light on the character of dental work a little more than a hundred years ago.

RELATION OF MEDICINE AND DENTISTRY

Up to a comparatively recent date, there was an astonishing ignorance in the medical profession as to the part which diseases of the mouth and of the teeth play in the general health of the body. It was assumed that teeth were devoid of the capacity of self repair, that dental disorders could be remedied by mechanical means alone; that all teeth, whether healthy or diseased, could be broken off or extracted without serious effect on the welfare of the body as a whole.

As a result of these unfounded assumptions, the profession of medicine for centuries gave little attention to the health of the teeth.

It was partly due to neglect of physicians themselves that dentistry began as a mechanical art and continued so for many years; and owing partly to this ignorance of the far-reaching pathologic significance of the disorders of the teeth, the practice of dentistry has developed apart from the other specialties of medicine.

In 1839, an unsuccessful effort was made to bring physicians and dentists together in one organization, but at that time physicians still believed that dental disorders were wholly local in their effects, that they had little or no influence on the general health and that medical attention was needed only if the adjacent tissue of the mouth were seriously involved in the disease.

By this process, dentistry has developed as an independent, and now closely organized, profession, but one that has a relation to the preservation of health quite as direct and as important as any other medical specialty. Dentistry is quite as much a branch of the general public health service as is any other specialty of medicine, such as those that have to do with eye, ear, nose, heart, lungs or any other special class of bodily disease. The question now is, therefore, what relation shall exist between these two great organizations for healing, made up of physicians on the one hand and of dentists on the other?

Certain definite and well-known facts can be stated as conforming the foundation upon which the relation of medicine and dentistry must rest.

1. Dentistry is a form of health service of the highest significance. The treatment of diseases of the teeth and of the tissue of the gums requires not only that the dentist shall be an educated man, in the cultural sense, but that he shall know the fundamental medical

sciences that other practitioners of medicine learn.

2. Dentistry is a highly mechanical division of the healing art. After years of development, the practice of dentistry has now become, in the main, the art of repairing, rebuilding and removing teeth; treating diseased conditions in the teeth and in the tissues adjacent to them; replacing, in a sanitary and esthetic manner, with artificial substitutes, the visible parts of extracted teeth. Today, the practice of dentistry aims to repel disease through improvement of the resources of oral hygiene, in large measure by mechanical means. Whether considered from the standpoint of hygiene, or of facial improvement and convenience, the practice of dentistry requires a high order of technical skill in addition to medical and scientific knowledge. In no specialty of medicine does delicacy of touch play a larger part. The medically trained dentist cannot turn these adjustments over to a mere mechanician.

3. Dentistry is now an independent and closely organized profession. Dentistry began to assume an organized independence about eighty-five years ago. There are now about 60,000 practitioners of dentistry in the United States and 3,200 in the Dominion of Canada. There are forty-three dental schools in the United States and five in Canada. In all the states of the union and in all the provinces of Canada, dentistry, like medicine, is regulated by law. Admission to practice is based upon educational requirements exacted by the state or provincial board of examiners.

While the primary object of both medicine and dentistry is to serve the cause of public health, there has been little cooperation between the associations of physicians and dentists or between individuals of the two professions.

CONCLUSION

The relation between medicine and dentistry ought to be one of intelligent cooperation. For the public, the quality of health service is the primary consideration. The public is not concerned either with the traditions or the prejudices or the partisanships that belong to either service. If dentistry, having been developed and established as an independent form of organized health service, can become the full equivalent of an oral specialty in medicine, and will accomplish this, in good order and without economic waste, as it appears inclined to do, then few would welcome the needless embarrassment of forcibly including it in conventional medicine. If dentistry as now organized does not develop the full health service equivalent of an oral specialty in medicine, public interest will ultimately require the creation of a specialty of medicine to render oral health service. The question is one to be determined upon the basis of adequate health service. It calls for unprejudiced and statesmanlike action on the part of both groups of practitioners and the associations that represent them. The public has a right to expect that intelligent cooperation shall unite these two bodies of health workers in a service whose responsibilities they share in common.

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Editorial

THE LAST CALL

This is the last rallying call for the Seventh International Dental Congress, which will convene in Philadelphia, Aug. 23-27, 1926. Everything humanly possible has been done to make this meeting in all respects the greatest ever held in the history of dentistry, and the outlook at present is most promising. The program which was published in our June issue has been greatly augmented by the addition of some important numbers, and it now constitutes the most representative aggregation of papers, addresses and clinics that has ever been prepared for any meeting.

The indications are that this event will bring together at least double the number of dentists that have ever before convened for a meeting, and the question might arise as to the problem of conveniently handling so many members; but the Committee on Organization and the Committee on Local Arrangements have had the situation clearly in mind and give us

every assurance that, no matter how large the attendance, there will be adequate facilities for taking care of every one without confusion or any great inconvenience. To this end, all meetings are to be held under one roof, and on one floor, so that all those in attendance may readily find their proper section or gain access to their favorite clinic without difficulty.

One thing the American members must set out to do—they must assume a sense of responsibility for the welcome and entertainment of the members and visitors from other countries. While America is only one part of this great event, and while the meeting is international in the truest sense, America, on account of the fact that the Congress is being held in the United States, is in a certain sense the host on this occasion, and should assume an attitude of solicitous care that everyone who comes from without her borders shall be made to feel wholly at home. Every American member of the Congress should constitute himself a committee of one to see that the greatest courtesy is extended to our visiting confreres, and no trouble should be considered too great in directing them to their sections or the various functions, or in lending any aid possible. We must aim to send our visiting members back to their respective homes filled with the sweet savor of hospitality and good fellowship, so that this meeting, in addition to its scientific achievements, will mark a new era in international comity and fraternity. To unite the profession in one integral and cohesive entity is one of the functions of these great congresses, and on this occasion America should stand sponsor for this idea, and see that it is carried out to the fullest degree.

If this meeting fulfils its ostensible mission, it will weld the profession of the various countries together as a stable unit, and advance dentistry in a way that has never been approached before. To this end, let us all work with a united will, and let those in America in particular accept the major responsibility of carrying the event through to a successful conclusion.

THE DISCOVERY OF ANESTHESIA

Ever and anon, the controversy over this matter bobs up like Banquo's ghost. A new contention has been precipitated by the unveiling of a statue to Dr. Crawford W. Long of Georgia in the Congressional Hall of Fame. This occurrence has brought forth an article by Dr. Emory A. Bryant, which we publish in this issue.

There is just one feature of this question to which we wish to refer at this time. It is well known that Dr. Horace Wells, a dentist of Hartford, Conn., demonstrated the use of nitrous oxid for the painless extraction of teeth in 1844, and that Dr. William T. G. Morton used sulphuric ether for surgery in 1846, and that these facts were published at the time.

The claim is made for Dr. Crawford W. Long that he used ether for painless surgery in 1842. Granted that this is true, the achievement evidently made little impression on him at the time, as is evidenced by the fact that his first paper on the subject did not appear till 1849, three years after the publication of Morton's achievement, and five years after the demonstration of Wells.

A pertinent and justifiable question might be raised as to which man is entitled to credit for a discovery—the one who finds out a fact and keeps it from the world, or the one who at once shares his discovery with mankind. To learn a thing of great value to humanity, and then keep the fact hidden for seven years might reasonably subject a man to censure rather than earn for him a place in the Hall of Fame, and we are inclined to endorse the contention made by Surgeon General Ireland in his letter to Dr. Bryant, which says: "Priority . . . is always determined by date of publication."

The policy that brings the greatest good to humanity is the one deserving of recognition, and surely a discovery that is kept from public announcement for seven years is not calculated to benefit humanity. Let us revere the names of the pioneers, but let us revere most the names of those who spontaneously gave of their knowledge the moment this knowledge was available.

CHARLES H. OAKMAN, D.D.S.

Charles H. Oakman, of Detroit, Mich., died at his home, June 25, 1926, after a brief illness. He was born in Detroit, sixty years ago, and had lived there all his life. He was graduated from the Chicago College of Dental Surgery in 1892, and had practiced in Detroit ever since, specializing in oral surgery. He graduated in medicine in 1906. He was prominent in civic affairs, and while a member of the board of health, was instrumental in establishing dental clinics for children. He also obtained an appropriation from the city council for an examination of the teeth of all the children of Detroit. He was a member of the Detroit house of correction board, and, through this agency, was able to work a betterment in the condition of prisoners, particularly in Wayne County jails. He was one of the trustees of the Pathfinders of America, an organization having for its object the inculcation of higher ideals and better living, and whose chief work is done for prisoners in our penal institutions and among the children of our public schools.

Dr. Oakman was an active member of the Detroit Athletic Club, the Detroit Golf Club and the Detroit Yacht Club. He was a prominent Mason, having been a past master of Palestine Lodge, No. 357, A. F. & A. M., King Cyrus Chapter No. 133, R. A. M., Detroit Commandery, No. 1, Knights Templar, and Moslem Temple Shrine.

He was also a member of Delta Sigma Delta fraternity, and of his city, state and national dental associations. He was active in all enterprises having for their object the betterment of dentistry, and his ideas were always sane, constructive and upbuilding.

As a man he was cordial, full of good cheer and most companionable. He drew men to him by the subtle bond of fellowship and fraternal impulse, and no one ever had a truer friend than he. He will be missed by a large circle of intimate acquaintances, and by his professional associates, with whom he was a constant tower of strength.

Dr. Oakman is survived by his wife, formerly Miss Margaret Gibb, whom he married in Port Huron in 1894, a son, Charles, 22 years old, who graduated this spring from the University of Michigan; and a daughter, Ruth, 24 years old. He also leaves three brothers, Milton, Robert and Joseph, and two sisters, Mrs. James Gilbert of Detroit, and Mrs. Elizabeth Daylis of Australia.

To all of these, the sympathy of the entire dental profession will go at this time.

CHARLES H. OAKMAN, D.D.S., M.D., F.A.C.S., Detroit, Michigan
(1865-1926)

DEPARTMENT OF DENTAL HEALTH EDUCATION

WHAT SHOULD A CITY DO FOR THE TEETH OF ITS SCHOOL CHILDREN?

By HAROLD H. MITCHELL,* M.D., C.P.H., Fall River, Massachusetts

THE dental hygienist and the dentist have generally been accepted by educators as a part of the school staff. But what these specialists should attempt to do is too often merely a vague generalization in the minds of the authorities. Extreme policies either of attempting more than the tax payer will adequately support, or of extensive dental repair and prophylaxis by a dentist that reaches too small a group of pupils for educational value, often result from misunderstanding of the function of the school in the field of dental hygiene. The leadership of far-seeing members of the dental profession is urgently needed.

The comprehensive Bridgeport or Fones program of dental prophylaxis, treatment and instruction has demonstrated its results. There is a tendency to copy the Fones plan, but the simulation is usually on an inadequate basis, with too few dental hygienists and with little or no educational features. Surely scattered efforts reaching only a small number of the children, and without a definite educational program, can make little progress.

Our newer knowledge of nutrition indicates that cleaning and filling the teeth are inadequate procedures even under the best of conditions. To change the status of the teeth of our children will demand comprehensive education and effective influence on the home diet. Prophylaxis by the dental hygienist and filling the first permanent molars are merely supplementary aids to the nutritional activities to build good teeth. No doubt much prophylactic and dental repair will be essential for a long time to come, if not always, but the first emphasis should be placed on nutrition.

Dental hygiene, therefore, becomes a part of the educational process and not altogether a service of dental prophylaxis and repair to be rendered at public expense. Although the work of the dental hygienist and dentist in the school does influence some children to give continued care to their teeth, it is doubtful that their efforts will effectively carry over into life habits unless associated with properly directed educational measures. The dental hygienist, as well as the dentist, is an important factor in developing the attitude, the habit and the knowledge for continued care of the teeth, but at best they can give only occasional or periodic instruction and stimulus. Continued care by the individual must be based on an appreciation of its importance that is attained by repetition and not by mere talk or textbook instruction.

*Director of School Hygiene.

The coordination of dental hygiene with the school or home program is therefore essential.

Education is the work of the teacher. Health education is now being recognized as a significant part of education, and we are learning that it can best be imparted by correlating it with other subjects of the curriculum. The teacher must, therefore, be given an appreciation of the dental needs of her pupils. Few teachers realize the condition of the mouths of the children under their care. The dirty, tartar covered teeth, the decayed first permanent molars and the retracted and spongy gums that foretell pyorrhea are appreciated only after careful inspections by the teacher under the direction of a dentist or a dental hygienist. Such a demonstration to the teacher immediately arouses interest and leads to more effective teaching of dental hygiene. Appreciation of the needs for this phase of education is the first step for seeking opportunities to correlate health education as it relates to nutrition and care of the teeth. The supervisor can suggest projects and devices with a prospect of results when the teacher seeks assistance.

In consideration of the importance of the teacher's appreciation and interest in dental hygiene, I experimented with a plan to reach the teachers through the cooperation of the local dental profession during a week of concentrated effort. The emphasis was placed on brushing the teeth and care by a dentist, as that phase was most closely related and most readily appreciated as a means of correcting tooth troubles. We are inclined to provide for the care of the sick in hospitals before we provide disease prevention. Our first interest is in treatment; later, we turn to prevention. The teacher most readily appreciates the immediate needs of her pupils with diseased mouths and decayed teeth. Later, she may be led to understand that prevention comes through good nutrition.

After a special meeting of a few interested dentists, all the reputable dentists of the city were called together at a meeting in the office of the superintendent of schools. Four types of services were suggested by which the dentists could cooperate in a week's campaign, and a committee of dentists was appointed to confer with the assistant superintendent of schools, to prepare a syllabus for both teachers and dentists. Thirty-six dentists agreed to give about one school session each during the week of the campaign, most of the dentists offering to give any one of the four types of service suggested, as follows:

1. Talks to pupils. 2. Demonstration to teachers of examinations of children's mouths. These demonstrations were designed to inform the teachers regarding the actual conditions that prevail in the mouths of their children and to demonstrate the type of mouth inspection that a teacher might make. 3. Talks to teachers regarding the salient points to be emphasized in teaching the care of the teeth. 4. Examinations of the teeth of all children in classes not previously examined and when the teacher made special application for the examination.

The state health department moving pictures and stereopticons were used where facilities were available. Drug stores were asked to display toothbrushes and tooth pastes. With the assistance of the state health department, daily educational stories were published by the newspapers. State health department

literature and Ferguson's book were made available to the teachers.

On Monday evening of the week of the campaign, the dentists met again for final suggestions as to how to interest the children through talks, and for instruction as to demonstrations and talks to the teachers. The dentists received these instructions gracefully on the basis of the assistant superintendent's superior knowledge of the technic of instructing pupils and teachers.

The response on the part of both teachers and dentists was all that could be desired. About 200 teachers applied for this special service, and many more joined the movement after the dentists had visited their schools. The dentists met all the assignments and demonstrated conditions in the mouths of the pupils so that the teachers gained a new realization of the problem of obtaining clean and healthy mouths. The teachers promptly expressed a demand for cheap toothbrushes that could be sold to the pupils who could not afford to purchase the usual brush. Brushes (seconds) were sold by them at 5 cents.

Although an actual survey before and after this campaign would be the logical criterion for judging the value of the week's effort, such a survey would be more extensive than the efforts given to the campaign. Such a measure was, therefore, impractical. It seemed reasonable, however, to claim the following advantages gained: 1. A large and important group of dentists gained a new realization of the attitude and work of the school and health authorities. 2. The dentists were lead to understand the relatively small part that the free dental clinic plays in the mouth hygiene program. 3. The dentists gained an appreciation of the work of the dental hygienist through their demonstrations to the teachers of the conditions to be found in children's mouths. 4. Important support for the expanded mouth hygiene program was gained through the dentists, newspapers, radio, movies and other publicity. 5. The teachers gained new knowledge and attitudes for better care of their own children's teeth. 6. The teachers tried and succeeded with new health education methods. 7. Children who had never used toothbrushes before bought and used them. 8. Parents were brought in touch with an important health education activity. 9. Pupils persuaded to go to a dentist by the teacher oftentimes broke down parental indifference and developed a positive interest in their own teeth. Such a positive interest leading to vigorous action means more for future habits of going to a dentist than parental force or persuasion without interest.

This plan should not be looked on as a means of meeting adequately the needs either of the teacher in appreciating dental hygiene or of the pupils in knowing when they should see a dentist. It is a form of propaganda that is sufficiently spectacular to reach the reading public and to stir teachers, parents and pupils to some appreciation of the problem. It affords a good introduction to a more comprehensive educational program.

Such a comprehensive school program for better teeth in the next generation should include:

1. *Education in Nutrition.*—A supervisor of health education on the school staff who can suggest and promote ways and means of developing knowledge, habits and appreciation of better nutrition is essential in any large school system.

2. *Education in the Care of the Teeth.*—This should be carried on by the teacher under the direction of the health education supervisor with the cooperation of other supervisors in the primary, elementary and high schools.

3. *Dental Hygienists to Examine Children's Teeth and Train Teachers in Such Facts Regarding Dental Caries, Care of the Teeth and Gums, Occlusion and Prophylaxis as Is Necessary for Their Educational Program.*—This training of teachers should be definitely arranged for by the health education supervisor so that each teacher has knowledge and appreciation of the condition of the teeth of the children in her classroom. Probably two or three hours a year will suffice to give the teacher this understanding and should result in greater cooperation from the teachers both in developing habits of care of the teeth of their pupils and correction of dental defects.

4. *Prophylactic Treatments by Dental Hygienists to Demonstrate and Promote Better Care of the Teeth by Private Initiative.*—The prophylactic treatment of the dental hygienist should be looked on as a stimulus and demonstration to persuade parents to employ continued prophylactic care rather than a comprehensive public service. Such demonstrations cannot be effective without suitable educational measures. Moving pictures, parent-teacher association demonstrations, talks, literature, competitions and projects that interest the children are a necessary part of the educational program.

5. *The Service of a Dentist for Filling and Preserving the First Permanent Molars on a Demonstration Basis.*—This demonstration might be given throughout the school system in successive grades during successive years beginning with the first grade and continuing through a period of five or six years. Accurate records and adequate publicity as to the results obtained, to demonstrate to parents the value of continued care, should yield an impress on the educational program that must be felt by pupils, teachers and parents.

6. *Dental Clinics on a Philanthropic Basis for Correction of Dental Defects by a Dentist.*—This service by a dentist should be afforded to indigents as medical and surgical service is now given.

This outline of a school dental hygiene program places the emphasis first on education. A service of prophylaxis by dental hygienists and treatment by dentists through the first five grades may yield more rapid results, but it seems that a more thoroughgoing educational program, through the teachers, under the direction of a health education supervisor, would yield more lasting results. We repeat that we cannot expect the results desired to be attained by a program limited to prophylactic and corrective treatment by dental hygienists and dentists. Therefore, if the program is to lean heavily on educational measures, the time and cost should be expended more largely on educational procedures. A program of prophylactic and dental service that reaches a large proportion of the pupils puts a heavy burden on the taxpayer for service that should be cared for by private initiative. Whatever value this service may render in an educational way in promoting continued care of the teeth, the cost is likely to limit the educational measures and we are likely to meet a serious difficulty in the form of the teachers inclined to regard the problem as one that is being met by the dental

hygienists and dentists. We must then put the educational problem squarely on the shoulders of the educational staff, and use the dental hygienists and dentists to demonstrate and offer expert advice to the teachers.

PLACE OF DENTAL HEALTH IN A GENERAL HEALTH PROGRAM*

By A. T. McCORMACK, M.A., M.D., D.P.H., F.A.C.S., Louisville, Kentucky

PUBLIC health is affected by four major functions of health departments: (1) quarantine to prevent the introduction of exotic pestilences; (2) sanitation, which has to do with the removal of environmental conditions in which lie the cause of disease; (3) personal hygiene, which includes personal health education and the annual periodic examination of the apparently well, and (4) remedial medicine to care for disease, accident and injury that occur in spite of the first three activities.

While these activities are all covered by boards of health, federal, state and local, it is well recognized by public health administrators that the most important members of their force are those in the first line of defense: the practicing physicians and dentists, particularly those in general practice.

General Gorgas set up the ideal health department in the Panama Canal Zone. Experts in that particular branch had charge of the maritime quarantine to prevent the introduction of disease from the outside. The sanitary officer, with the cooperation of an effective laboratory, which included a competent entomologist and highly trained sanitary inspectors, and the intelligent cooperation of the population, soon made environmental sanitation nearly perfect. These activities soon removed the menace of yellow fever plague and other exotic pestilences and reduced malaria, typhoid and the exanthematous diseases to a minimum; but by far the most important part of General Gorgas' constructive program in Panama has been overlooked by students of Panama Canal sanitation. Every American or foreign employe who came to the Canal had a careful, recorded physical examination; and this was repeated annually. The general practitioners in the line dispensaries had these records, and when patients came to them complaining of any condition, they had the definite record of their examination when apparently well. This enabled the practitioner to recognize apparently trivial deviations from the normal and to interpret tendencies toward disease at earlier stages than anywhere else. The general practitioners were thus enabled to refer their cases to specialists, when necessary, for operative or other procedures. These specialists included competent dentists, and the records of the Canal show that the correction of dental defects is one

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1925.

*The papers of Drs. McCormack and Wilson and of Miss Hardy, published in this issue, together with the paper of Dr. Cross, appearing in the July issue, make up a symposium.

of the major activities of its health service.

At about the same time, the physical examination of school children was undertaken at various points in this country. At first, these examinations were rather haphazard and superficial, as they are even yet in most cities, but the mass of statistics that soon accumulated focused attention on the appalling number of physical defects and foci of infection found, which would unquestionably reduce the thinking power of the affected child and would probably develop acute or chronic disease in later life. The importance of these studies was emphasized by the researches of Billings and others in regard to focal infection. It occurred to practical members of our professions in numerous cities that discovering the defects in children was important only if steps were taken to educate the parents as to the importance of the correction of these defects. This movement may be considered fairly stabilized now, although it is carried through effectively in relatively few health jurisdictions.

After a few years, it became evident that many of the defects from which school children suffer might quite as easily have been corrected during the preschool age without the resulting loss of time during school attendance; and the preschool clinic resulted. Progressive specialists in the diseases of children, including those who were limiting their practice to dental defects, have determined that many of these are due to conditions that arise in infancy and in the prenatal stage, and have suggested that probably many more of them are due to defects in diet. This focused our attention and study on the examination, first, of mothers and fathers as to their contribution to defects of infants, and, as time has passed, it has become evident that the periodic examination, annually, of everyone, while apparently well, is the next essential step in sanitary progress. The importance of this movement was first recognized by the great life insurance companies, and the organization of the Life Extension Institute in New York, and its published results have demonstrated beyond the possibility of a doubt that such annual periodic examination means an extension of more than 25 per cent in longevity of the examined individual, if he has sufficient intelligence to profit by the examination in the slight changes in habit which are necessary to correct his tendencies toward disease.

Just as the intelligent public began to realize the importance of the annual periodic examination of the apparently well, the World War came on. The medical and dental professions were compelled by it to make the first examination *en masse* of a definite unit of our population over the whole country. The developments did not surprise the few physicians and dentists who had already been interested in this movement, but they did emphasize to the world that a third of the young manhood of the United States had physical defects or diseases which made them unfit to fight. The examinations also developed that our technic for such examinations of the apparently well was so crude that many conditions that ought to have been apparent to examiners were overlooked or misjudged.

Sufficient evidence has been presented now for us to understand that, under our present organization of remedial medicine, most individuals arrive at middle life with definite defects developed during childhood or adolescence

which will lower their longevity, and which will contribute to diseases causing impairment to their usefulness to society during the latter decades of their shortened lives.

The great problem which confronts the allied medical and dental professions is the reconstruction of our organization so that it actually reaches and secures the confidence of an increasing percentage of our population, until everyone has a thoroughly complete physical or health examination annually, so that each individual possesses an actual invoice of his health condition and is really advised as to the practical things he must do to relieve the slight beginnings of disease rather than wait, as has been the practice in the past, until these have more or less incapaciated him. That such examination should be made by his family physician and family dentist is so apparent as to require no further discussion. That the results of such examination should be recorded on standard forms, so that the individual removing from one locality to another can secure his records and take them to his physician and dentist in his new environment is equally evident.

The most important part of the health organization of the future, as in the past, will always be the family physician and family dentist. The only reason for the development of public volunteer or official agencies to prevent or control disease will be the failure of our professions to reach a considerable proportion of the population, either urban or rural.

Pending the evolution of professional organizations and to attain this desired end, demonstrations will have to be made to convince not only physicians and dentists, and especially medical and dental educators, but also the public. These will be made, in the case of the indigent, in public health clinics. They will be most valuable in counties or cities having well developed and effectively managed health departments. In most of our states, there are large rural sections which are the granaries of the race and in which are probably the most important element of our citizenship who merit—even demand—public health consideration. It is therefore evident that, in such states, the state health department must, with the cooperation of the county medical and dental societies, develop programs for diagnostic clinics that will reach any element of the population that has heretofore been neglected.

As an example of the necessity for such demonstrations, there may be cited, the experience of the United States Public Health Service and the State Board of Health of Kentucky with trachoma. In 1912, a careful survey demonstrated the fact that there were more than 50,000 cases of the disease, largely in the rural sections, in Kentucky. Hospitals were located at strategic points after Dr. John McMullen, of the Federal Service, had perfected a technic which rapidly relieved the individuals suffering from the disease. Men, women and children affected by it thronged the hospitals, but it was soon apparent that only the more acute sufferers of more than average intelligence would be reached in this way, and it became necessary to organize traveling clinics, which were held in the smaller towns after systemic examinations had been made of the school children of the surrounding territory.

These clinics, with the active support of the local medical society, were quite effective, but they reached only the smaller number of children who were

in school, and most of those affected with trachoma did not attend school and were not under the supervision of any physician. As a result, there was developed the traveling clinic, with a portable hospital which moved from neighborhood to neighborhood and made actual house-to-house canvasses to find the sufferers and convince them of the necessity and effectiveness of the operation. Fourteen years of this campaign has reduced the number of cases of trachoma in Kentucky from more than 50,000 to less than 3,000.

It is important to remember that practically as many of these cases have been cared for and relieved by their physicians as by the public clinic, but the clinic emphasized the importance of the whole matter and dramatized the possibility of relief to the public. In the same way, the state health department should provide for diagnostic clinics for dental defects. These should be under the direction of a competent dentist. He should keep in touch with and coordinate the work of the dentists who are in the all-time health departments of the cities and more progressive counties and who, of course, are working practically entirely with the indigent, but his most important function is to organize traveling clinics which will go from community to community and, while making actual diagnosis of dental defects, will educate both the children and the adult population as to the necessity for and methods of prevention and relief of dental defects.

Such a dental division would, of course, work in close cooperation with the other public health activities and would be particularly engaged with the dietetic and nutrition experts, who will be of the largest assistance in the development of preventive dentistry. I would emphasize, especially, the importance of every individual being under the health supervision of his private physician and dentist. Only when these are not available or do not function should the introduction of a public clinic ever be considered, except for temporary educational purposes.

It is evident that such a program will require and support a considerably larger number of highly trained physicians and dentists who will be able to detect and correct most of the disease conditions that now afflict humanity, in proportion as they are able to secure the cooperation of an increasingly educated public.

THE RELATION OF THE DENTAL HYGIENIST TO THE DENTAL PROFESSION AND THE PUBLIC*

By EDITH C. HARDY, D.H., Rochester, New York

ON the back of a recent copy of a well known dental magazine is this quotation:

Of all human ambitions, an OPEN MIND, eagerly expectant of new discoveries and ready to remold conviction in the light of added knowledge and dispelled ignorance and misapprehension, is the noblest, the rarest and the most difficult to achieve.

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1925.

The profession of the dental hygienist is one to be reviewed by the dentist and the public with an open mind, for in many cases it has required a complete remodeling of conviction.

How many of the dentists of today can see in the dental hygienist only someone who is stealing their profession from them and usurping their rights? The nursing profession, one of the noblest professions open to women today, had many years of hard struggle before the splendid work of the trained and registered nurse was universally recognized, and we who are of the earlier classes of the trained and registered dental hygienist have had uphill work to demonstrate to the dental profession and to the public the vast field which is open to young women who are willing to give of their time and knowledge to help in the great campaign for "Better Health" through a healthy mouth.

The dental hygienist, as Dr. C. N. Johnson has said, is first and foremost a teacher, whether she is on the staff of a public school, hospital, institution or private office, and as such she must have had some special training so that she may impart to the public the essentials of a clean mouth, and, in most cases, this must be supplemented by instructions as to the care of the body in health. The physician and nurse will teach how to repair bodily ills and the dentist can remedy tooth defects, but in this day of the specialist, who is to tell the mother or child how he may keep well? This is the field of the dental hygienist, and it is so wide and so broad that she can occupy her time completely without stepping into the operative field of the dentist.

The dental hygienist is proud of her profession; she has in nearly every case selected her work because of her desire to serve, and it is the desire of the American Dental Hygienists' Association that she may so live up to this great ideal that she will receive only constructive criticism, and that, with the cooperation of the American Dental Association, a great work may be accomplished.

It has been suggested by one dentist that instruction in mouth hygiene to mothers of young children (children of preschool age and infants) should be given by the family physician, but, in many cases, the child is brought to the physician only when it is ailing and to the dentist when it is suffering from toothache. Nearly every community has some organization that reaches the parents, either mothers' clubs, parent-teacher associations, home bureaus or health clubs, and it has been found that these clubs are generally very willing to cooperate with any scheme that will benefit the community. A series of talks given to parents on the need of proper mouth care, supplemented by talks to young mothers on prenatal care, has been found to create great interest. If it is possible to give more than one talk, a demonstration of prophylaxis, toothbrush drill and suitable posters will add much to the interest of the audience. A plaster model of a normal mouth set up in an articulator, so that it can be used for demonstration purposes, will often suggest to the parent a question relative to Mary or Dick's teeth. This should be followed by an examination of the mouth and throats of one or two children, attention being drawn to the chief defects found.

This education work of the dental hygienist is at present almost entirely volunteer work, and it is usually given out of business hours, but it has often

been the forerunner of systematic examination of the teeth of school children, and, in some instances, all children entering school (first grade and primary) have been required to show a certificate of examination from a dentist or from an institution before entering school. This educational work in the smaller communities could be extended if the members of the dental profession would release the dental hygienist for possibly one or two afternoons a month, depending on the number of hygienists in a county, so that she might attend the meeting of the mothers clubs rather than have to give her talks in the evening when mothers of young children find it difficult to attend. Instead of finding that the dental hygienist has been an added liability, it would soon be found that the practice of the average dentist had been enlarged.

In interviewing dentists and ascertaining their objection to the dental hygienist, a varied assortment of reasons were compiled. Some of these objections you have all heard many times. It has been fully demonstrated that the dental hygienist would not think of exceeding her authority by filling or extracting teeth any more than the members of the dental profession would remove tonsils or amputate fingers, or the registered nurse perform major operations. There may be exceptions, but not every dentist who has graduated from a reputable dental college is living up to the ideals of the profession. If the dental hygienist does do operative work other than that allowed by law, the responsibility is the dentist's, and I should like to suggest that cooperation between the ethics committees of these associations now in session would tend to lessen the number of offences. The American Dental Hygienists' Association will gladly report any violation of the dental hygienists' law. It has a high standard to maintain and will use any power it may possess to keep the profession on a high plane.

Another objection offered against the dental hygienist is the high salaries demanded by them. The dentist voicing this objection had been practicing for twenty years and claimed that, in spite of working nearly every evening and many Sundays, he had never been able to afford a vacation. By actual record, it has been proved that the dental hygienist can earn her salary and that her services help considerably with the overhead expenses. Take the case of this man who worked so many hours during a week. He would see at least six or eight patients a day, probably more. If a dental hygienist gave prophylactic treatment to five of these patients, it would enable the dentist to do just that much more operative work and at the same time allow for a few leisure hours. If a dental hygienist gives five or even four prophylactic treatments a day at the regular fee for that work, at the end of a week she will have seen twenty-five or thirty patients. This is a conservative estimate, because in a busy practice in which the dental hygienist does nothing but the prophylactic work and is responsible for the recalling of patients, the average per day is six patients. Instruction to patients in the home care of the mouth occupies much of the time of a busy dentist. This service can be successfully handled by the dental hygienist, and any particular theory that the dentist has can be taught to the dental

hygienist, and his instructions be given his patients without interference with his operative work. The dental hygienist is particularly adapted to give instruction to children, and can often overcome the inborn fear of the child making its first visit to a dental office.

Children of the average well-to-do business man are often the most neglected of all children as regards dental care. They are given a toothbrush and told to clean their teeth, but few of them receive systematic inspection from a dentist. The child of poor parents finds its way into some kind of clinic and eventually arrives at the dental department. Children in the public schools are more and more receiving attention, but the child of the private school or boarding school is often in great need of dental work. If this need can be shown to the parents, they are usually willing to have the children come to the dentist, especially if the responsibility of making the appointments is assumed by the dental hygienist. At times it has been found beneficial to have the children come to the office once a week for inspection. This especially applies to the child of from 10 to 12 years. It often stimulates interest in the progress they make in caring for their mouths, and as these children frequently come in alone, it is an easy matter to give individual talks, using charts and literature if the occasion arises. Sometimes, reports are made to the parents by telephone, and any instructions given to the child are repeated to the parent; but, in most cases, if the right appeal has been made, the child will take better care of his own mouth, if the responsibility is put up to him, than he would if he has to be reminded by his mother.

The United States Army has recognized the importance of a healthy mouth and has already begun to train men to give prophylactic treatments. Colleges are requiring a certificate of health, including one from a dentist, as a preliminary requirement for college entrance, and when the percentage of caries per person is realized, and how small a number of dentists there are who can give their time to instruction and prophylactic treatments, it is apparent that there is indeed a vast field open to the dental hygienist.

The graduate hygienist would like to see a course for the training of the dental hygienist for public health work given as a postgraduate course, supplementing the year of training given in general training. The average girl entering a training school for dental hygienists does not know much of what her training will consist, or what her work will entail, and if, at the end of a year's schooling, she could continue her studies, covering subjects suitable or required by a public health hygienist, possibly a number of girls would take up this line of work who had not previously realized the great field which is open to the public health hygienist, and those who had graduated some years earlier would be able to return to school and benefit by the course given to the later classes.

Undoubtedly, the time given to the training of the dental hygienist will be lengthened, as the need for greater knowledge is shown, and the American Dental Hygienists' Association will welcome the day when uniform entrance requirements and state laws are the order of the day throughout this great country.

737 Park Avenue.

OPERATIVE TECHNIC FOR THE CONSERVATION OF DECIDUOUS TEETH*

By HARRIS R. C. WILSON, D.D.S., Cleveland, Ohio

THE prime motive of technical collegiate study is to prepare a man to earn a better living. This motive is entirely legitimate, even without considering the secondary motives. The study of a profession differs from the study of a business in that the profession contemplates a certain self-sacrifice for the general good. Were it not for this idealism in dentistry, our calling would be no better than a trade. All too often, our environment and the pressure of modern living lead us to almost lose sight of the ideals that we have been taught in our professional school life. The strife for gold and more gold absorbs our attention until we fail longer to think of our relation and our duty to our fellows.

One who seeks gold as his aim in life should avoid a public health career, for gold is not at the goal. Contentment and satisfaction with a life well spent in service to one's fellows is the reward with which we must be satisfied. Once, inspired to resign himself to service for the common good, one is ready to tackle his work with all his might and render his best effort. Such is the attitude of the men we want and seek as school dentists to serve the children attending mouth hygiene clinics.

Personality is a dominant factor in the selection of school dentists. One who can adapt himself to difficult situations, one who can lead by kindness rather than drive, is the type that will succeed with children. Patience, infinite patience, is necessary. One who can understand the child and be sympathetic, yet cheerful and firm, has a great advantage with children. The one who sees the broken down crown of a tooth as an opportunity for a root filling or a bridge has not the mouth hygiene point of view; but the man who sees the possible infection and systemic disease that may result by retaining this septic root has the public health point of view, and his first thought will be to eliminate all possible sources of later disease. Because of the modern point of view on infection, we always prefer to employ men just out of school rather than men who have been in dental practice for some years.

The practice of dentistry has, throughout its history, been curative and restorative in intent; and naturally so, for the sick have appealed to us as a profession and have aroused our interest and sympathy; therefore, we have sought to relieve, i. e., cure and restore lost tissue, to the best of our ability. This is right and proper for the private practitioner of dentistry.

The function of a board of education cannot be interpreted as being "to read to the public, and to do sums for the public." Its function is to teach children to read and do sums for themselves. We believe that a board of education should teach the coming citizen how to live; that is, how to live as one of a large group in a smoky city; how to

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1925.

earn a living as one of a group; and how to preserve himself both for his own comfort and enjoyment and for the good of humanity. Therefore, it becomes a function of a board of education to train a child in the care of his physical body; to train his feet, his hands; to train his eyes, his ears; and to train him to care for his teeth as a part of his anatomy that needs special attention. It is the function of a board of education to teach the child the best knowledge the world possesses regarding the food he should eat, and the clothing he should wear; in fact, it is the function of a board of education to give each child a well-rounded education, even to the extent of teaching him how to use his leisure time profitably.

With these thoughts in mind, you have the point of view from which we are conducting the mouth hygiene activities in the Cleveland Schools.

It is not consistent for a board of education to render dental service in the junior and senior high schools. It is not the function of a board of education. This is the function of the dental profession. It is commonly accepted, and I believe it true, that a private practitioner of dentistry can be of great value to the boy or girl with defective teeth. We believe it our function and so examine the mouth of each boy and girl in the public school system, in the kindergarten and six elementary grades, about 102,000. This examination is made once a year. These children are referred to the private practitioner of dentistry for his care whenever attention is necessary. The board of education sends literature on the care of the mouth into the homes of all public school children. We advise when a dentist is needed, but do not diagnose the case for the dentist. It is not our function to make a diagnosis beyond determining whether or not the mouth needs the attention of a dentist. We deem this service of educational value and preventive in its nature. We do undertake to care for the defects in the teeth of our first grade, 6-year-old, children when requested by the parents. This we justify as a preventive and educational measure, because it teaches the child to care for the dental defects early; and we also try to teach the children that these baby teeth and first molars should be *well* cared for. Another reason that the board of education should feel justified in this service is that the dental profession has so far been unable, or, may I say unwilling, to assume the responsibility of caring for the mouths of the 6-year-old children. In plain language, the average dentist does not wish to bother with the 6-year-old child.

In doing this work, which some will call restorative or corrective—we call it preventive because it prevents future infection—we aim to render an ideal operation as far as is humanly possible. Our first responsibility is to see that first permanent molars are cared for, and we try to do this as soon after the eruption of the first permanent molars as possible. All first permanent molars are considered to need filling when the explorer point definitely catches and holds in the fissure. If the operator is doubtful as to the need of filling, he treats the tooth with silver nitrate—a strong solution—and waits a short time for definite diagnosis.

As regards the conservation of temporary teeth, on which I was asked to speak particularly: I have tried to present our point of view and have brought out the fact that our operative

clinical work is on 6-year-old children almost exclusively, and it will be appreciated that, next to the saving of first permanent molars, which is of prime importance, the temporary teeth receive our attention.

Bear in mind that my following remarks apply to 6-year-old children. Our instructions to the operators in the mouth hygiene clinics are either to fill or to extract every decayed tooth. In other words, there is no "passing the buck" by neglecting to do something. If the temporary tooth should normally be shed in six months or less, a cavity in the same may be filled with cement if the operator deems best; but we discourage the use of cement. If the tooth should normally last longer than six months, the operator is directed to use amalgam for the filling. We recommend that all pulpless teeth be extracted as a health measure. We deem the danger from infection greater than the danger from lessened mastication.

In our clinic, Dr. Lerch and I will show that proximal amalgam fillings may be placed in vital central and lateral anteriors without destroying the pulp. The temporary molars are treated exactly as permanent molars, the larger pulp chamber and the proximity of the cornu of the pulp to the surface being kept in mind. All deep cavities, and this includes cavities that would not be considered deep in adult teeth, are lined with thymolized calcium phosphate, covered with a bit of cement, and filled with amalgam. All amalgam fillings are carved and polished. The copper matrix is used wherever a contact point is to be restored. Some may criticize this service as too good. Nothing is too good when it comes to mending the human anatomy. Our men become finished operators with high ideals. What we have just recited is our method of handling existing conditions. This is preventive in the sense that it prevents further decay and infection; but the real prevention comes in teaching right living as we know it.

Right living includes normal rest, fresh air, water inside and out, and, we believe most important, proper diet. We try to develop in each child a sense of cleanliness so that he will keep his mouth clean; which is a definite factor in prevention of tooth decay. But cleanliness is not so important a factor as food. We send literature into the homes of 100,000 children each year as one means of securing better and cleaner teeth. We sell toothbrushes at cost (10 cents) as another aid to the same end. The hygienists do their part in teaching the children the idea of cleanliness of the mouth. The grade school teachers are having the children make health posters, always including teeth. The children write rhymes about teeth and other health subjects. They listen to fairy tales about teeth and health. I fail to see how any child can pass through six or seven years in the Cleveland schools without a fair appreciation of mouth cleanliness and proper diet, together with the other health habits. Such we deem the function of mouth hygiene in the schools.

My own feeling is that the most difficult thing we have to do is to secure the cooperation of the home, to change not so much the dietary ideas of Europe as the dietary ideas that have been acquired from American advertising of prepared foods; prepared so that much of the food value has been removed; prepared so that the article is easy and quick to serve, but so that the child is

deprived of the tooth and bone building and growth promoting ingredients.

Further, we must carry into the home the idea of breast feeding for all infants; and the idea that the mother must have the right diet during pregnancy.

Mouth hygiene cannot make real progress until we succeed in putting over the prenatal and preschool age program of proper diet, which we grant will be a slow process. Some of this program can be put over in the junior and senior high schools, but we must reach the masses in the elementary grades.

SUMMARY

1. We try to create the health point of view in each of our field workers.
2. We insist on the elimination of dental infections.
3. We require the best technical work in restorations.
4. We use all the means at our disposal to teach preventive measures.
5. We believe that the future of mouth hygiene lies in the prenatal and preschool age programs.

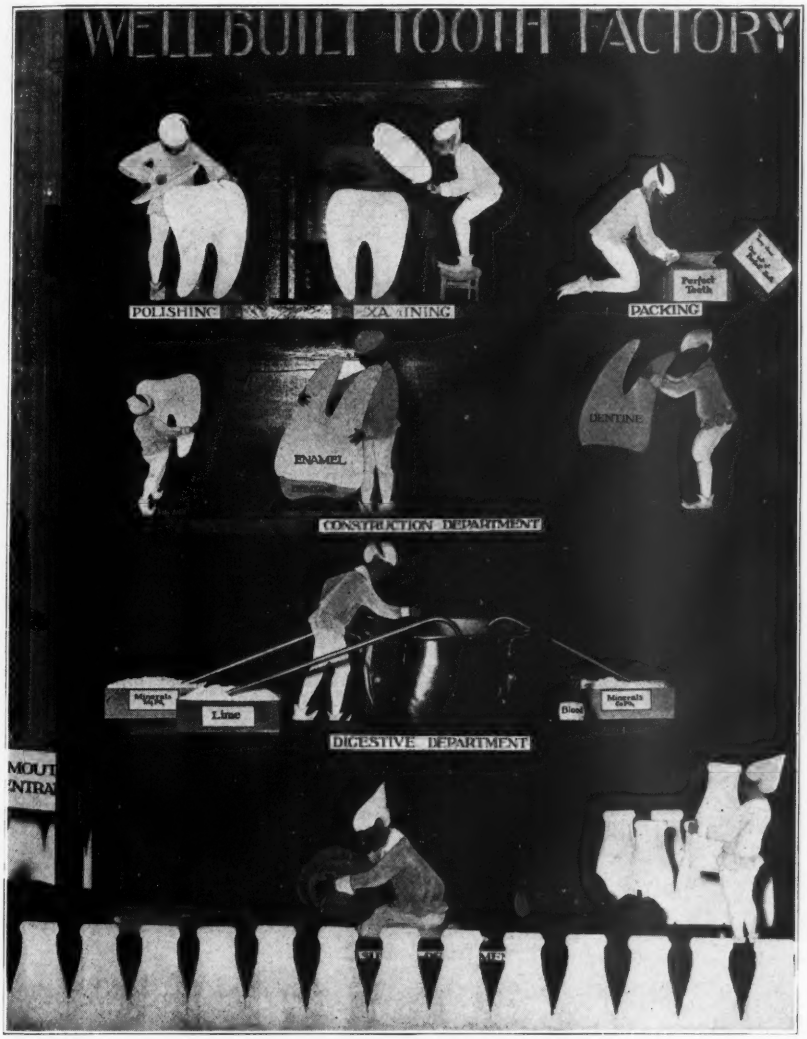
THE DENTAL HYGIENE EXHIBIT OF THE MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

To be consistent with its new dental policy, which states that it will "Furnish information concerning the relation of nutrition to tooth development to the public," the Massachusetts Department of Public Health has planned and developed a new dental hygiene exhibit. This new exhibit consists of two factories—The Well Built Tooth Factory and The Poor Food Tooth Factory, which, with their little carts of suppiles, their attractive or barren yards, different departments and final shipping of teeth to "Jawville," tell in a vivid and graphic way the story of what is happening in the mouth and jaws of every child from 2 to 6 years, according to the kind of diet that the child is getting. We must get the message to our mothers and children that strong teeth are built, not brushed, and how better could this be done than by a toy factory with one side removed so that one can see the whole process revealed?

The Well Built Tooth Factory is surrounded by a fence of white milk bottles, sturdy and strong, and a lawn of well cut green grass. At the left, in the yard, a cart is standing, full of fruit and vegetables from the country, ready to be unloaded for the supply department, which is the first floor of the factory. Here, vegetables, fruit, dark bread and milk are sorted into neat piles and sent up little chutes to the floor above which is the digestive department. This floor has a large kettle in the center in which all the foods are digested, and from this kettle run little tubes carrying the various minerals—calcium, magnesium, phosphorus, the metal for good red blood into separate boxes. These boxes are full and nearly over-flowing. On the floor above the constructive department, we see the teeth actually being made—first the pulp; then, the dentin, and, lastly, the enamel, which is hard, white and perfect. These teeth are carried up a little ladder into the polishing room, where they are polished and passed to the next room. Here they are examined for cracks or defects. If any are found, the teeth are tossed out, as only perfect teeth are shipped from this factory. Finally, the teeth reach the last room of the factory, where they are assembled in perfect sets, packed in boxes and sent down a big chute to a truck waiting below. These sets are delivered at the specified time to the people that live in "Jawville."

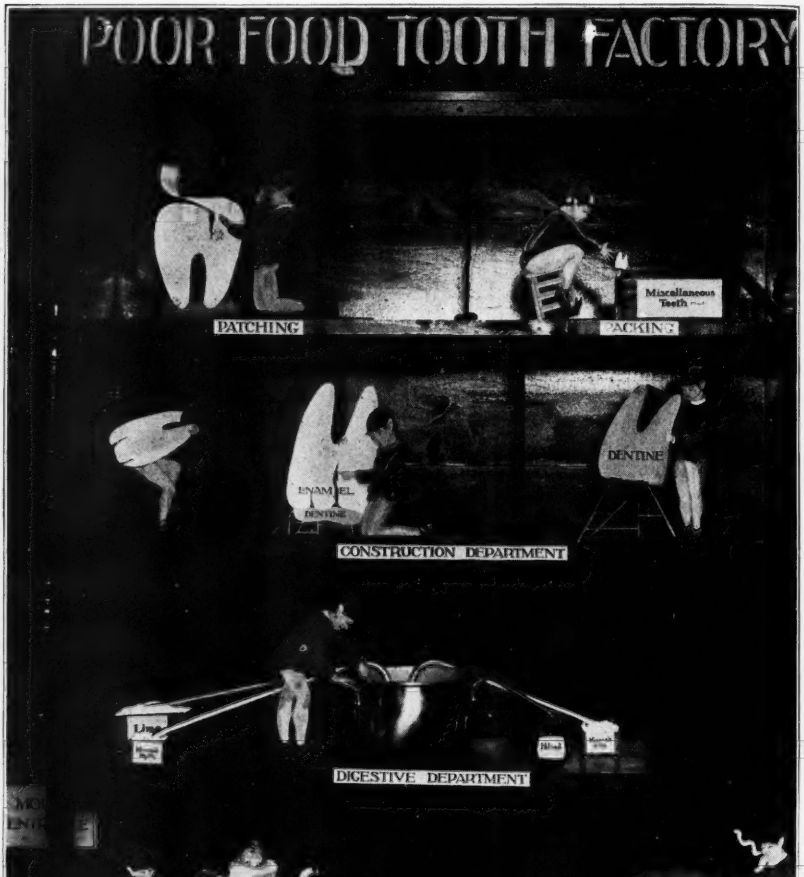
The other factory, The Poor Food Tooth Factory, presents the other side of the story. Here the workmen are tired and lazy. They are trying vainly to make good teeth without the right materials to work with and without enough air and sunshine. This factory has a brown and yellowish-green color scheme and is surrounded by a dingy fence of coffee

pots. Its supply wagon is full of candy, potatoes, coffee and meat. The supply department is not kept in order. Only a few supplies go up the chute to the digestive department, and the rest are tossed into a large box labeled waste. On the next floor, the worker is trying hard to get enough minerals out of the kettle, but he does not succeed, and the boxes for calcium, magnesium and phosphorus are only half full. In the constructive



Dental hygiene exhibit "Well Built Tooth Factory."

department, we see the result of this lack of supplies in the little cracks appearing in the enamel of the tooth. On the top floor, a workman patches the worst of these cracks, and, in the packing room, the teeth are tossed into big boxes in a haphazard fashion and dropped down the chute. Unlucky is the person who receives a box from this factory.



Dental hygiene exhibit "Poor Food Tooth Factory."

MEMBERS OF THE HOUSE OF DELEGATES, 1926*

DELEGATES AND ALTERNATES

ALABAMA

Delegates

Olin Kirkland, Shepard Building, Montgomery
J. A. Blue, Empire Building, Birmingham
C. W. Lokey, Empire Building, Birmingham

Alternates

H. Clay Hassell, Tuscaloosa
Charles F. Chandler, Montgomery
L. A. Neil, Albany

ARMY DENTAL CORPS

Delegate

Robert T. Oliver, Dental Corps, Army Building, 39 Whitehall St., New York City

Alternate

Arnett P. Matthews, Dental Corps, Washington Barracks, D. C.

CALIFORNIA STATE

Delegates

Guy S. Millberry, U. C. Dental College, San Francisco
A. R. McDowell, 344 Fourteenth St., San Francisco
Frank C. Pague, 209 Post St., San Francisco
Max Wasserman, Jr., 323 Geary St., San Francisco
B. Frank Gray, 209 Post St., San Francisco

Alternates

Frank H. McKevitt, St. Paul Bldg., 291 Geary St., San Francisco
James Allen Graham, 209 Post St., San Francisco
T. Sydney Smith, 209 Post St., San Francisco
Charles A. Sweet, 242 Moss Ave., Oakland
Hugh Avary, 209 Post St., San Francisco

COLORADO

Delegates

E. R. Warner, 412 Metropolitan Bldg., Denver
W. T. Chambers, 719 Metropolitan Bldg., Denver
L. T. Walsh, 414 Thatcher Bldg., Pueblo

Alternates

E. E. Bailey, 601 Majestic Bldg., Denver
W. P. Smedley, 604 California Bldg., Denver
C. S. Kramer, M. W. A. Sanatorium, Woodmen

CONNECTICUT

Delegates

C. G. Brooks, 302 State St., New London
J. A. Bray, 57 Pratt St., Hartford
A. C. Fones, 10 Washington Ave., Bridgeport
M. J. Loeb, 66 Trumbull St., New Haven

Alternates

E. F. Cory, 62 Trumbull St., New Haven
A. A. McLaughlin, 616 Medical Bldg., Bridgeport
W. L. Weed, 54 S. Main St., South Norwalk
J. W. Borchardt, 108 Bank St., Waterbury

DELAWARE

Delegate

Edward F. Cullen, Kane Apts., Wilmington

Alternate

J. Draper Brown, 10th & Madison Sts., Wilmington

DISTRICT OF COLUMBIA

Delegates

Mark F. Finley, 1829 I St., N. W., Washington
C. W. Camalier, 1029 Vernon Ave., Washington

Alternates

Fenton Bradford, The Rochambeau, Washington
E. S. Smith, 1101 17th St., N. W., Washington

FLORIDA

Delegates

C. J. Caraballo, Stovall Bldg., Tampa
H. B. Patishall, Peninsular Bldg., Jacksonville

Alternates

A. W. Sears, Professional Bldg., Jacksonville
F. C. Boardman, Orlando

GEORGIA

Delegates

DeLos L. Hill, 12 West 11th St., Atlanta
A. A. Lawry, Valdosta
R. R. Byrnes, 100 N. Butler St., Atlanta

Alternates

F. C. Wilson, Savannah
H. H. Williamson, Albany
R. H. Calhoun, 701 Lamar Bldg., Augusta

*This list will be revised, July 21, 1926, in accordance with the ruling as presented in the Constitutional By-Laws, under Chapter IV: Sec. 3.—The number of delegates to which each constituent society may be entitled shall be based on the number of members from whom dues for the current year shall have been received by the general secretary of this Association at least thirty days prior to the first day of the annual Session of this Association. . . . Sec. 6—Previous to the annual Session the general secretary of this Association shall prepare and have printed a list of the delegates and alternates, elected by the various constituent societies; also the number of paid members of each.

IDAHO

Delegate

C. P. Charrier, Boise

Alternate

R. J. McCabe, Box 563, Nampa

ILLINOIS

Delegates

William F. Whalen, 906 Lehmann Bldg., Peoria
T. L. Grisamore, 29 E. Madison St., Chicago
A. E. Converse, Leland Office Bldg., Springfield
Arthur D. Black, 122 S. Michigan Ave., Chicago
Arthur G. Smith, 534 Jefferson Bldg., Peoria
Harry B. Pinney, 108 N. State St., Chicago
E. D. Coolidge, 25 E. Washington St., Chicago
C. R. Baker, 708 Church St., Evanston
J. H. Cadmus, 25 E. Washington St., Chicago
H. E. Phillips, 5457 S. Ashland Ave., Chicago
G. G. Knapp, 1203 W. Garfield Blvd., Chicago
Hugo G. Fisher, 25 E. Washington St., Chicago
J. C. Waddell, Murphy Bldg., East St. Louis
Harold S. Smith, 1010 Belmont Ave., Chicago
B. S. Partridge, 1305 E. 63rd St., Chicago
Ray S. Cook, 1010 Belmont Ave., Chicago

Alternates

L. H. Wolfe, Wells Bldg., Quincy
E. Byron Kelly, 25 E. Washington St., Chicago
J. W. Ford, 25 E. Washington St., Chicago
Colburn H. H. Brevig, 3329 Fullerton Ave., Chicago
Harold R. H. Brevig, 3329 Fullerton Ave., Chicago
H. H. White, 25 E. Washington St., Chicago
E. Maginnis, 25 E. Washington St., Chicago
G. Walter Dittmar, 59 E. Madison St., Chicago
William A. Murray, 627 Grove St., Evanston
O. J. Olafsson, 506 S. Elmwood Ave., Oak Park
E. H. Thomas, 30 N. Michigan Ave., Chicago
L. S. Huhn, 3166 Lincoln Ave., Chicago
C. W. Hillier, 841 W. 63rd St., Chicago
C. N. Johnson, 58 E. Washington St., Chicago
J. W. Smith, Belleville
S. A. Hutt, 3166 Lincoln Ave., Chicago

INDIANA

Delegates

A. R. Ross, Lafayette
C. R. Jackson, 904 Hume Mansur Bldg., Indianapolis
C. E. Redmon, Peru
P. H. Chadwick, Rushville
W. A. Hall, Michigan City
F. R. Henshaw, 904 Medical Arts Bldg., Indianapolis
W. E. Neuenschwander, 401 Medical Arts Bldg., Fort Wayne

Alternates

W. O. Vallette, Goshen
L. E. VanOsdol, Peru
W. R. Meeker, Peru
Victor H. Knapp, 510 Citizens Bk. Bldg., Evansville
Rex N. Douglas, 109 Lexington Ave., Elkhart
R. R. Gillis, Hammond
Charles A. Priest, Marion

IOWA

Delegates

John Scholten, 360 Amer. Trust Bldg., Cedar Rapids
C. H. Henshaw, 1112 Bankers Trust Bldg., Des Moines
J. G. Hildebrand, Waterloo
F. H. Waters, Ames
C. V. Watts, 315 K. P. Bldg., Des Moines
J. E. Forney, Keokuk

Alternates

E. S. Smith, 613 E. Court St., Iowa City
C. M. Kennedy, 603 Iowa National Bank Bldg., Des Moines
H. D. Coy, Hamburg
C. M. Work, Ottumwa
H. J. Altfillisch, Bank & Insurance Bldg., Dubuque
E. L. Moravec, Cedar Rapids

KANSAS

Delegates

G. A. Grise, Manhattan
G. E. Burkett, Kingman
F. O. Hetrick, Ottawa
E. E. Carpenter, 625 Kansas Ave., Topeka

Alternates

E. C. Glass, Independence
W. T. Triplett, Salina
J. M. Jones, 710 Orpheum Bldg., Wichita
Harry McFarland, 10th Fl. Argyle Bldg., Kansas City

KENTUCKY

Delegates

E. C. Hume, 914 Francis Bldg., Louisville
W. M. Randall, 1035 S. Second St., Louisville
E. D. Rose, Bowling Green
R. P. Thomas, 3324 W. Broadway, Louisville

Alternates

Charles S. Pearcy, 709 Starkes Bldg., Louisville
J. H. Fullenwider, 662 Francis Bldg., Louisville
Hugh McElrath, Murray
M. M. Eble, 907 Starkes Bldg., Louisville

LOUISIANA

Delegates

J. P. Wahl, 1135 Maison Blanche, New Orleans
S. S. Grosjean, 816 Howard Ave., New Orleans

Alternates

C. S. Tuller, 729 Maison Blanche, New Orleans
Walter Leabo, 503 Ricou-Brewster Bldg., Shreveport

MAINE

Delegates

C. S. Holmes, Calais
Henry A. Kelley, Trelawny Building, Room 815, Portland

Alternates

Alton H. Swett, Portland
Frank R. Holmes, Eastport

MARYLAND

Delegates

George E. Hardy, 518 Cathedral St., Baltimore
Norval H. McDonald, 304 Morris Bldg., Charles & Saratoga Sts., Baltimore
J. C. Fowler, 3939 Greenmount Ave., Baltimore

Alternates

J. Stephenson Hopkins, Belair
A. H. Paterson, Commonwealth Bank Bldg., S. E. Cor. Howard & Madison, Baltimore
J. Ben Robinson, 219 W. Monument St., Baltimore

MASSACHUSETTS

Delegates

W. Vernon Ryder, 15 Bay State Road, Boston
J. William O'Connell, 393 Main Street, Wakefield
Frank T. Taylor, 419 Boylston Street, Boston
David F. Spinney, 1330 Beacon Street, Brookline
Frank A. Delabarre, 520 Beacon Street, Boston
Leroy M. S. Miner, 153 Newbury Street, Boston
W. Henry Grant, 107 Massachusetts Ave., Boston

Alternates

Harold W. Alden, 160 Main Street, Northampton
William H. Gilpatric, 358 Commonwealth Ave., Boston
Richard H. Norton, Jr., 15 Bay State Road, Boston
Leon A. Storz, 507 Main Street, Worcester
Frank P. Simpson, 18 Bank Row, Pittsfield
T. P. Sullivan, 318 South Main Street, Fall River
William Rice, 416 Huntington Avenue, Boston

MICHIGAN

Delegates

Chalmers J. Lyons, 1004 Oakland Avenue, Ann Arbor
Edwin J. Chamberlain, 519 Ashton Bldg., Grand Rapids
William E. Browning, Benton Harbor
Marcus L. Ward, 1308 Cambridge Rd., Ann Arbor
James P. Locke, 216 Metz Bldg., Grand Rapids
F. W. Northrup, 1042 Stroh Bldg., Detroit
William A Cook, 1853 David Whitney Bldg., Detroit

Alternates

J. H. Armstrong, Belding
Ray L. Sexton, 518 Metz Building, Grand Rapids
E. A. Honey, 903 Hanselman Avenue, Kalamazoo
C. G. Parker, 1047 David Whitney Bldg., Detroit
W. A. Stander, 412 Metz Bldg., Grand Rapids
A. J. Norman, 1111 Stroh Bldg., Detroit
Claude E. Hathaway, Ionia

MINNESOTA

Delegates

A. T. Rowe, 820 La Salle Bldg., Minneapolis
H. B. Washburn, 462 Lowry Bldg., St. Paul
M. E. Ernst, 1150 Lowry Bldg., St. Paul
F. E. Cobb, 601 Donaldson Bldg., Minneapolis
C. E. Rudolph, 905 Met. Bk. Bldg., Minneapolis
H. A. Maves, 500 Donaldson Bldg., Minneapolis
F. J. Kaiser, 438 University, St. Paul

Alternates

L. C. McCarthy, 1227 Lowry Bldg., St. Paul
C. K. Bird, 329 Lowry Bldg., St. Paul
B. G. DeVries, 933 Met. Bk. Bldg., Minneapolis
L. D. Leslie, 505 Donaldson Bldg., Minneapolis
George S. Monson, 405 Lowry Bldg., St. Paul
J. A. Heidbrink, 616 Donaldson Bldg., Minneapolis
Julius A. Peterson, 5628 W. Grand Ave., Duluth

MISSISSIPPI

Delegates

W. R. Wright, Jackson
J. F. Brunson, Meridian

Alternates

L. A. Smith, Port Gibson
Barney Kennedy, Jackson

MISSOURI

Delegates

C. B. Coleman, Poplar Bluff
W. M. Bartlett, Wall Bldg., St. Louis
W. F. Ross, Schneider Building, St. Joseph
J. P. Harper, Grand and Caroline Sts., St. Louis
W. A. Roddy, Frisco Bldg., St. Louis
J. C. Warnock, 644 Lathrop Bldg., Kansas City
C. B. Mitchell, Bowling Green

Alternates

W. W. Brown, Joplin
Jesse D. White, Univ. Club Bldg., St. Louis
James T. Hull, Butler
George B. Scott, Wall Bldg., St. Louis
George E. Haigh, Jefferson City
J. R. Rinehart, 10th and Troost St., Kansas City
Hugh G. Tanzey, Tower Bldg., Country Club Plaza, Kansas City

MONTANA

Delegates

P. J. Sweeney, Red Lodge
B. J. Keenan, Butte

NATIONAL CAPITAL

Delegate

M. M. Dolmage, 825 Vermont Ave., N. W., Washington, D. C.

NAVY DENTAL CORPS

Delegate

Lieut. Com. Marion E. Harrison, Bureau of Medicine and Surgery, Navy Dept., Washington, D. C.

Alternate

Lieut. Com. Leon Martin, D.C., U.S.N., Navy Yard, Philadelphia, Pa.

NEBRASKA

Delegates

E. H. Bruening, 1129 First National Bank Bldg., Omaha
G. A. Grubb, University of Nebraska, College of Dentistry, Lincoln
H. E. King, 546 Peters Trust Bldg., Omaha

Alternates

W. L. Shearer, 619 City National Bank Bldg., Omaha
M. E. Vance, 714 Security Mutual Bldg., Lincoln
O. H. Cressler, North Platte

NEW JERSEY

Delegates

Richard S. Hopkins, 913 Broad St., Newark
Matthew C. Pearce, 308 Main St., Orange
William H. Gelston, 40 N. 30th St., Camden
Frederick H. Lum, Jr., Chatham
William E. Truex, 16 W. Main St., Freehold
Walton J. Graft, 5 W. Park St., Newark

Alternates

Louis F. Kuntz, 180 Smith St., Perth Amboy
Edward C. Stillwell, 71 Winsor Place, Glen Ridge
John S. Owens, 109 N. Fifth St., Camden
Benjamin W. Crane, Morristown
William W. Hodges, 175 Smith St., Perth Amboy
Frank T. Maxon, 113 North Ave. W., Cranford

NEW MEXICO

Delegates

C. C. Clarke, Socorro
J. J. Clark, Artesia

NEW YORK

Delegates

Martin Dewey, 17 Park Avenue, New York City
F. A. Gouch, 184 Joralemon St., Brooklyn
E. W. Briggs, 1116 Madison Ave., Albany
A. C. Rich, 96 Lake Ave., Saratoga Springs
T. R. Cullen, Oswego
C. M. Dunne, 15 Broad Street, Norwich
E. G. Link, 226 Cutler Bldg., Rochester
Louis Meisberger, 468 Delaware Ave., Buffalo
William C. Fisher, 501 Fifth Ave., New York City
R. Ottolengui, 80 W. 40th St., New York City
G. M. Fiero, 40 North St., Buffalo
E. R. Webb, 415 University Block, Syracuse
Harvey J. Burkhart, 800 Main St. East, Rochester
Theodor Blum, 140 W. 57th St., New York City
D. A. Sniffen, 20 Church St., White Plains
C. F. Baylis, Main St., Oneonta
A. R. Cooke, 815 University Block, Syracuse

Alternates

John L. Peters, 133 W. 72nd St., New York City
Thaddeus P. Hyatt, 576 Fifth Ave., New York City
E. H. Gale, 141 Washington Ave., Albany
L. A. Timerman, 39 Market St., Amsterdam
G. B. Beach, 518 S. A. & K. Bldg., Syracuse
H. D. Whitmarsh, 112 Oak St., Binghampton
Gerald G. Burns, 603 Professional Bldg., Rochester
G. G. Pritchard, 468 Delaware Ave., Buffalo
H. C. McBriar, Middletown
F. R. Adams, 8 West 40th St., New York City
Robert L. Murray, 761 Elmwood Ave., Buffalo
E. I. Harrington, Watertown
B. W. Palmer, 232 University Ave., Rochester
Arthur S. Litten, 140 W. 69th St., New York City
R. Morrow, Nyack
Fred B. Howe, 411 Sav. Bk. Bldg., Ithaca
George H. Butler, 314 Waverly Ave., Syracuse

NORTH CAROLINA

Delegates

H. O. Linberger, Raleigh
J. Martin Fleming, Raleigh
B. F. Hall, Asheville

Alternates

J. N. Johnson, Goldsboro
J. A. McClung, Winston-Salem
P. R. Falls, Gastonia

NORTH DAKOTA

Delegates

William J. Hewett, Grand Forks
Albert Hallenberg, Fargo

Alternates

F. J. Hartl, Minot
R. S. Towne, Bismarck

OHIO

Delegates

F. M. Casto, 1334 F. B. Keith Bldg., Cleveland
Homer C. Brown, 609 Hartman Bldg., Columbus
John F. Stephan, 1034 Keith Bldg., Cleveland
E. C. Mills, 255 E. Broad St., Columbus
G. C. Nixon, Mah. National Bank Bldg., Youngstown
T. I. Way, 341 Doctors Bldg., Garfield Place, Cincinnati
C. W. Mills, Chillicothe
Harry Cope, 327 E. State St., Columbus
Weston A. Price, 8926 Euclid Ave., Cleveland

Alternates

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P. J. Aufderheide, 9107 Miles Ave., Cleveland
E. S. Braithwaite, Willard
C. Stanley Smith, 511 Neave Bldg., Cincinnati
G. H. Williamson, Portsmouth
J. V. Gentilly, 764 Rose Bldg., Cleveland
W. H. Hayden, 228 Lincoln Ave., Youngstown
J. K. Douglas, Sandusky
J. J. Welker, 1143 Ohio Bldg., Toledo

OKLAHOMA

Delegates

A. E. Bonnell, 402 Surety Bldg., Muskogee
C. R. Lawrence, Enid
W. T. Jacobs, 205½ Barnes Bldg., Muskogee

Alternates

C. L. White, 1205 Medical Arts Bldg., Oklahoma City
S. A. Long, McAlester
Fred D. Sparks, Ponca City

OREGON

Delegates

Henry Cline Fixott, 533 Morgan Bldg., Portland
Herbert C. Miller, N. P. D. College, Portland

Alternates

Carl E. Miller, 510 U. S. Bank Bldg., Salem
Charles H. Walrath, N. P. D. College, Portland

PENNSYLVANIA

Delegates

P. V. McParland, 706 Highland Bldg., Pittsburgh
C. R. Turner, 40th & Spruce Sts., Philadelphia
H. E. Friesell, Schenley Apts., Pittsburgh
A. C. Barclay, 914 Highland Bldg., Pittsburgh
W. L. Fickes, East End Trust Bldg., Penn. & Highland Aves., Pittsburgh
O. J. Specker, 51 N. 4th St., Reading
W. C. T. Bauerle, Flanders Bldg., Philadelphia
A. C. Young, 121 University Place, Pittsburgh
E. R. Sausser, 235 S. 15th St., Philadelphia
A. B. Miller, 299 Wyoming Ave., Kingston
W. J. McKinley, 635 Spruce St., Philadelphia
R. E. Black, Huntingdon
D. S. Gardner, Dime Bank Bldg., Scranton
M. F. Quinn, 1222 N. 18th St., Philadelphia

Alternates

A. I. Wise, Schmidt Bldg., Pittsburgh
C. J. Hollister, State Dept. of Health, Harrisburgh
B. P. Rial, 4506 Fifth Ave., Pittsburgh
J. E. Aiguier, 1116 Medical Arts Bldg., Philadelphia
A. P. Lee, 235 S. 15th St., Philadelphia
J. C. Nugent, 540 Central Trust Bldg., Altoona
L. P. Anthony, 211 S. 12th St., Philadelphia
G. S. Schlegel, 147 N. 8th St., Reading
J. A. Standen, 1629 Spruce St., Philadelphia
W. A. McCready, Highland Bldg., Pittsburgh
S. B. Luckie, 333 Broad St., Chester
R. M. Walls, 62 E. Broad St., Bethlehem
J. D. Whiteman, Mercer, Pa.
W. E. Mendel, 405 E. Ohio St., Pittsburgh

PORTO RICO

Delegates

Francisco G. Garcia, Box 62, Rio Piedras, P. R.
Jose Herandez Gutierrez, Box 48, San Juan, P. R.

RHODE ISLAND

Delegates

Charles J. Smith, 146 Westminster St., Providence
Ambrose H. Lynch, 511 Westminster St., Providence

Alternates

Edward F. Gill, Olneyville
Joseph P. Massicotte, Olneyville Square, Providence

SOUTHERN CALIFORNIA

Delegates

J. P. Buckley, 1550 Heyworth Ave., Los Angeles
Bert Boyd, 1010 Story Bldg., Los Angeles
H. Jerome Allen, 2 East Pedregosa St., Santa Barbara
C. O. McBean, 1008 Hollingsworth Bldg., Los Angeles
James L. Howard, Security Bank Bldg., Hollywood

Alternates

J. Franklin Cook, 511 S. Bonnie Brae St., Los Angeles
Shirley W. Bowles, 808 Merritt Bldg., Los Angeles
N. W. Goodwin, 708 Story Bldg., Los Angeles
M. Evangeline Jordon, 1125 Marsh Strong Bldg., Los Angeles
T. M. Lynn, 607 S. Grand Ave., Los Angeles

SOUTH CAROLINA

Delegates

George W. Dick, Sumter
A. Weinberg, Sumter

Alternates

E. A. Early, State Board of Health, Columbia
H. J. Ray, Aiken

SOUTH DAKOTA

Delegates

W. W. Price, Centerville
H. F. Stevens, Aberdeen

Alternates

Ernest W. Elmen, Sioux Falls
E. O. Dietrich, Sioux Falls

TENNESSEE

Delegates

Joe Minor, Bennie-Dillon Building, Nashville
George L. Powers, Bank of Commerce Bldg., Memphis
F. W. Meacham, Hamilton Nat. Bank Bldg., Chattanooga

Alternates

Justin D. Towner, 1206 Exchange Bldg., Memphis
J. G. McDowell, Hitchcock Bldg., Nashville
L. G. Noel, 527½ Church Street, Nashville

TEXAS

Delegates

J. J. Simmons, Wilson Bldg., Dallas
George H. Mengel, 314 Roberts, Banner Bldg., El Paso
B. F. Thielen, Paris
H. W. Hoffer, Kaufman
H. M. Davison, Hubbard
W. R. Weber, Littlefield Bldg., Austin

Alternates

F. M. Hight, 1031 Bankers Mort. Bldg., Houston
Trimble E. Houston, Corsicana
C. D. Wofford, Plainview
A. F. Walters, Medical Arts Bldg., Dallas
W. B. McCall, Scott & White Hospital, Temple
S. B. Riggs, 502 Russell Bldg., San Antonio

VERMONT

Delegate

H. B. Small, Burlington

VIRGINIA

Delegates

T. Wood Campbell, American Bk. Bldg., Suffolk
Harry Bear, 410 Professional Bldg., Richmond
M. B. Rudd, 415 E. Grace Street, Richmond

Alternates

W. N. Hodgkin, Warrenton
H. L. Smith, Charlottesville
J. E. John, Roanoke

WASHINGTON

Delegates

C. J. Stansbury, 1332 Medical and Dental Bldg., Seattle
Aubrey L. Martin, 1704 Medical and Dental Bldg., Seattle

WEST VIRGINIA

Delegates

H. L. Satterfield, Fairmont
Fred E. Hess, Fairmont
I. J. Kail, Huntington

Alternates

W. E. Minghini, Martinsburg
J. S. Stone, Clarksburg
F. W. Black, Bluefield

WISCONSIN

Delegates

J. J. Wright, 1218 Wells Bldg., Milwaukee
J. C. Mortonson, 414 First Nat. Bk. Bldg., Milwaukee
R. W. Huegel, 104 King St., Madison
George A. Stratton, Oshkosh
G. E. Cleophas, Beloit
D. P. Wheeler, 23 S. Pinckney St., Madison

Alternates

M. H. Mortonson, 414 First Nat. Bk. Bldg., Milwaukee
E. C. Wetzel, Majestic Bldg., Milwaukee
T. W. Welch, Waupun
John F. Mortell, Oshkosh
N. E. Uelmen, 407 Wells Bldg., Milwaukee
J. M. Donovan, Neenah

WYOMING

Delegates

Peter Appel, Jr., Hynds Bldg., Cheyenne

Alternate

William Kocher, Casper

TRUSTEES

John F. Stephan, '28, Cleveland, Ohio
William F. Walz, '28, Lexington, Ky.
Frank T. Taylor, '28, 419 Boylston St., Boston, Mass.
C. C. Allen, '27, 10th and Troost St., Kansas City, Mo.
Charles M. Benbrook, '27, 707 Auditorium Ag., Los Angeles, Calif.
R. H. Volland, '27, Iowa City, Iowa
H. J. Burkhart, '26, Box 35, East Avenue P. O., Rochester, N. Y.
C. W. Hall, '26, 123 Grand Ave., Milwaukee, Wis.
W. R. Wright, '26, Jackson, Miss.

PAST PRESIDENTS

E. T. Darby, Philadelphia, Pa., 1883-1884
J. D. Patterson, Kansas City, Mo., 1892-1893
Harvey J. Burkhart, Rochester, N. Y., 1898-1899
L. G. Noel, Nashville, Tenn., 1902-1903
M. F. Finley, Washington, D. C., 1905-1906
A. H. Peck, Chicago, Ill., 1906-1907
A. R. Melendy, Knoxville, Tenn., 1911-1912
F. O. Hetrick, Ottawa, Kan., 1912-1913
Homer C. Brown, Columbus, Ohio, 1913-1914
Donald McKay Gallie, Sr., Chicago, Ill., 1914-1915
Thomas P. Hinman, Atlanta, Ga., 1915-1916
Lafayette L. Barber, Toledo, Ohio, 1916-1917
William H. G. Logan, Chicago, Ill., 1917-1918
C. Victor Vignes, New Orleans, La., 1918-1919
John V. Conzett, Dubuque, Iowa, 1919-1920
H. E. Friesell, Pittsburgh, Pa., 1920-1921
Thomas B. Hartzell, Minneapolis, Minn., 1921-1922
J. P. Buckley, Los Angeles, Calif., 1922-1923
William A. Giffen, Detroit, Mich., 1923-1924
C. N. Johnson, Chicago, Ill., 1924-1925

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Academy of Periodontology, August 20-21, 1926, New York City.

American Dental Assistants Association, August 19-21, 1926, Philadelphia, Pennsylvania.

American Dental Golf Association, August 27, 1926, Philadelphia, Pennsylvania.

American Dental Hygienists Association, August 23-24, 1926, Philadelphia, Pennsylvania.

American Society of Oral Surgeons and Exodontists, August 20-21, 1926, Philadelphia, Pennsylvania.

American Society of Orthodontists, August 16, 1926, New York City.

Federation of American Women Dentists, August 23-26, 1926, Philadelphia, Pennsylvania.

First International Orthodontic Congress, August 16-20, 1926, New York City.

International Orthodontic Congress, August 16-20, 1926, New York City.

National Association of Dental Examiners, August 21, 1926, Philadelphia, Pennsylvania.

Seventh International Dental Congress, August 23-27, 1926, Philadelphia, Pennsylvania.

Xi Psi Phi Fraternity, National Alumni Chapter, August 21, 1926, Philadelphia, Pennsylvania.

Canadian Dental Association, August 16-19, 1926, Halifax, N. S.

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

National Capital at Washington, D. C., first Tuesday of every month.

August (1926)

Pennsylvania, at Philadelphia (23-27).

October (1926)

Florida, at Daytona.

November (1926)

Arizona, at Phoenix.

December (1926)

Nevada, at Reno (4).

Ohio, at Columbus (7).

Odontological Society of Western Pennsylvania, at Pittsburgh, November 29-December 1, 1926.

EXAMINATION FOR APPOINTMENT TO THE DENTAL CORPS, U. S. N.

A competitive examination for appointment to the Dental Corps of the U. S. Navy will be held, Sept. 13, 1926, at the U. S. Naval Medical School, Washington, D. C. Appointees must be citizens of the United States, between 21 and 32 years of age at the time of appointment, which may be one or two months later than the date on which the examination will be completed. Candidates must submit with their applications certificates of birth and citizenship, of graduation from an accepted high school, or the equivalent, and from a dental school, and

two or more letters testifying to good habits and moral character. Applications should be addressed to the Chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. The examination will be both theoretical and clinical and the usual duration is from seven to ten days. No allowance can be made for the expense of persons appearing for examination.

M. E. HARRISON,
Lieut. Cmdr. (DC), U. S. Navy Officer-in-Charge, Dental Division.

SOUTH DAKOTA STATE DENTAL SOCIETY—RESOLUTION

The following resolution was adopted by the South Dakota State Dental Association in regular session, May 12, 1926:

By the authority of the executive council, your committee in session begs to report on the matter as to what constitutes an ethical dentist, and refer to the Code of Ethics as adopted by the American Dental Association.

We further commend the action taken by the staff of the Sacred Heart Hospital located at Yankton, S. D., in not allowing any other than ethical members of the American Dental Association to hold membership on the staff or render dental services in that institution; and we further recommend that the above resolution be adopted at this session of the South Dakota State Dental Association.

Be it further resolved: that we recommend the above resolution for adoption by the South Dakota State Board of Health, and appeal to the hospital association for their cooperation.

H. F. STEVENS,
E. H. WILSON,
Committee

MISSING—PERCY W. WALLER

In accordance with a request of his mother, Mrs. E. J. Hutter, 236 New Jersey Ave., Washington, D. C., a description of Percy W. Waller, who is missing, is appended: height, about 5 feet, 6 inches; weight, about 160 pounds; eyes, blue; hair, very dark, worn brushed back; complexion, dark; manner, quiet; smooth shaven; aged 32; tatto mark of eagle and shield on left arm, with initials P. W. W.

UNIVERSITY OF TORONTO

Faculty of Dentistry—Annual Dental Practitioners' Course

All ethical dental practitioners are invited to spend one week, Sept. 13-18, 1926, inclusive, in the intensive study of modern procedures in various branches of dentistry. The course will be held the week following the Canadian National Exhibition. Registration form will be sent on application to the Dean, Faculty of Dentistry, University of Toronto, Dental Building, Toronto 2.

FEDERATION OF AMERICAN WOMEN DENTISTS

The Federation of American Women Dentists will hold its annual meeting August 23-26, at Philadelphia, Pa., with headquarters at the Bellevue-Stratford Hotel. There will be a luncheon, Monday, August 23, and a banquet will be held at the Bellevue-Stratford, Thursday evening, August 27. The Federation extends a cordial welcome to all ethical women dentists. Women dentists of foreign countries are to be guests of the Federation at the banquet.

JOSEPHINE D. PFEIFER, *President*,
25 E. Washington St.,
Chicago, Ill.

DENTAL CORPS, U. S. ARMY

The Adjutant General of the Army has authorized the Surgeon General, all corps area commanders, the Commanding General, District of Washington, and the commanding officers of exempted stations, to permit officers of the Dental Corps under their respective commands to attend the meetings of the International Orthodontic Congress at New York City and the Seventh International Dental Congress at Philadelphia, Pa., provided the services of such officers can be spared and that no expense to the Government is involved. The International Orthodontic Congress will meet, Aug. 16 to 20, and the Seventh International Dental Congress, Aug. 23 to 27, 1926. The annual banquet of the Association of Military Dental Surgeons will be held at 6:30 p. m., August 26, during the International Dental Congress.

AVERY G. HOLMES,
Captain, D.C., U. S. Army.

THE MORRIS L. CHAIM AND THE BENJAMIN LORD PRIZE FOR 1926

The First District Dental Society of the State of New York announces a prize of $250 offered by the Morris L. Chaim Fund and a prize of $150 offered by the Benjamin Lord Fund, to be known as the Morris L. Chaim Prize and the Benjamin Lord Prize, respectively, for 1926, and to be awarded at the regular meeting in December, 1926.

CONDITIONS

1. Eligibility. Members in good standing of any bona fide dental, medical or scientific society, or duly registered students of a recognized educational institution, prior to submission of the manuscript, are eligible to compete.

2. Date. Papers are to be submitted on or prior to Nov. 1, 1926, to the secretary of the First District Dental Society, 250 West 57th Street, New York City.

3. Papers.

A. The Morris L. Chaim Prize is offered for the most acceptable paper in the field of science and art as related to dentistry, the paper to embody the results of original research not previously published.

B. The Benjamin Lord Prize is offered for the most acceptable paper in the field of clinical dentistry having an immediate and direct value in its application to practical needs, the paper to embody the results of original research not previously published.

The manuscript shall be typewritten, and accompanied by all necessary photographs, drawings, diagrams and tables, and shall be ready for publication.

4. Award. The award shall be made by the board of directors of the First District Dental Society of the State of New York. At the discretion of the board, the prizes may be divided between the papers adjudged to be of equal merit, or both prizes awarded for one paper, if in the opinion of the judges, it merits them.

5. Publication. The First District Dental Society of the State of New York will consider the publication of the successful papers, but publication by the First District Dental Society of the State of New York shall not be binding on either party.

6. Wherever and whenever published, the papers awarded the prizes shall be accompanied by the statement: "Awarded the Morris L. Chaim (or the Benjamin Lord Prize, or both) in 1926, by the First District Dental Society of the State of New York."

MILO HELLMAN, *Chairman*
ALFRED WALKER
LELAND BARRETT

RATES TO SEVENTH INTERNATIONAL DENTAL CONGRESS

Sesquicentennial railroad tickets, on sale daily at one and one half fares, are available to all members of the American Dental Association, except those from the following territory, to whom Identification Certificates have been sent:

All of the New England States.

New York State (east of and including Buffalo, Niagara Falls, Suspension Bridge and Salamanca), New Jersey, Pennsylvania (east of and including Erie, Oil City and Pittsburgh), Delaware, Maryland, District of Columbia, Virginia and West Virginia (east of and including Wheeling, Parkersburg, Kenova, Orange and Norfolk).

In the territory of the Central and Southeastern Passenger Associations, the time limit will be fifteen days. In the Western and Southwestern Passenger Associations, the time limit will be fifteen days, east of the Missouri River. For Missouri River points and territory west, a time limit of thirty days will be given. From Pacific coast points, summer excursion tickets will be on sale from May 27 to September 15, limited for return to October 31. This is somewhat better than the convention rate on one and one-half fares.

D. C. BACON, *Chairman*,
Transportation Committee.

AMERICAN COLLEGE OF DENTISTS

The annual convocation of the American College of Dentists will be held in the Bellevue-Stratford Hotel, Philadelphia, Pa., Sunday evening, August 22, at 6 o'clock.

ALBERT L. MIDGLEY, *Secretary*,
Union Trust Bldg.,
Providence, Rhode Island.

TRANSPORTATION ARRANGEMENTS FOR PHILADELPHIA MEETING

In order that a number of members of the American Dental Association attending the Philadelphia convention may avail themselves of one of the various return routes at the conclusion of the convention, the Transportation Committee has appointed the Powers Tours as transportation directors to handle details covering travel on two itineraries, one covering direct route to Philadelphia, with a day stop-over at Washington and a two-day visit at New York on the return; the second covering a tour by rail and steamer to Montreal, Quebec, returning via Niagara Falls.

All such matters as hotel accommodations, and sight seeing trips, at reasonable prices, have been prearranged and all reservations made.

The most competent conductors and escorts, prepared to give valuable information and to point out the places most worth seeing, will serve the traveler in every way. Should illness supervene, every possible assistance will be given.

We are assured a most comprehensive itinerary at a minimum cost. It is impossible, at this date, to show in detail all the forms of entertainment available in different sections, but this itinerary is offered with a confident assertion that no organization in recent years has been given better values.

The entire cost of the tour will be known definitely at the outset, and unsurpassed privileges will be secured on the most economical basis.

The number of inquiries already made indicates that a large special train will be required and plans are being made on that basis. Reservations should be made direct to the Powers Tours, 105 N. Clark St., Chicago, who will forward a special folder covering all details of the tours. It will aid everybody concerned in the happiness and comfort of the party if reservations are promptly made.

Quite a number have already made hotel reservations at Philadelphia during the period of convention and it will therefore be appreciated if those members will so specify, naming the hotel, when writing for their train reservations. It is understood that the Powers Tours will assume payment of these reservations for members joining our party.

THE TRANSPORTATION COMMITTEE
D. C. BACON, *Chairman*

ITINERARY

As a certain number of members find it necessary to arrive at Philadelphia on Friday, August 20, to attend meetings of allied societies, arrangements have been made to provide for their comfort and convenience, special equipment leaving Chicago from the Union Station, Thursday, August 19, going direct to Philadelphia, on the following schedule:

Lv. Chicago (Penn. R. R.) ..... 1:00 p. m. (CT) Thursday, August 19
Ar. Philadelphia (Penn. R. R.) ..... 9:00 a. m. (ET) Friday, August 20

This advance party will be accompanied by a special escort, who will look after all transportation matters enroute as well as transfer of passengers and baggage from station to hotel at Philadelphia.

There will be a charge of $5.00, in addition to the rates shown below, for those who travel on an advance itinerary as above.

TOUR NO. 1

A special train carrying the main convention party of the American Dental Association will leave the Union Station, Chicago, Saturday, August 21, on schedule as below. This train will consist of high class all-steel equipment.

Lv. Chicago (Penn. R. R.) ..... 1:05 p. m. (CT) Saturday, August 21
Ar. Washington (Penn. R. R.) ..... 9:15 a. m. (ET) Sunday, August 22

(Two sight-seeing drives—one at 9:45 a. m. and another at 2:00 p. m.)

Lv. Washington ..... 7:00 p. m. (ET) Sunday, August 22
Ar. Philadelphia ..... 10:00 p. m. (ET) Sunday, August 22

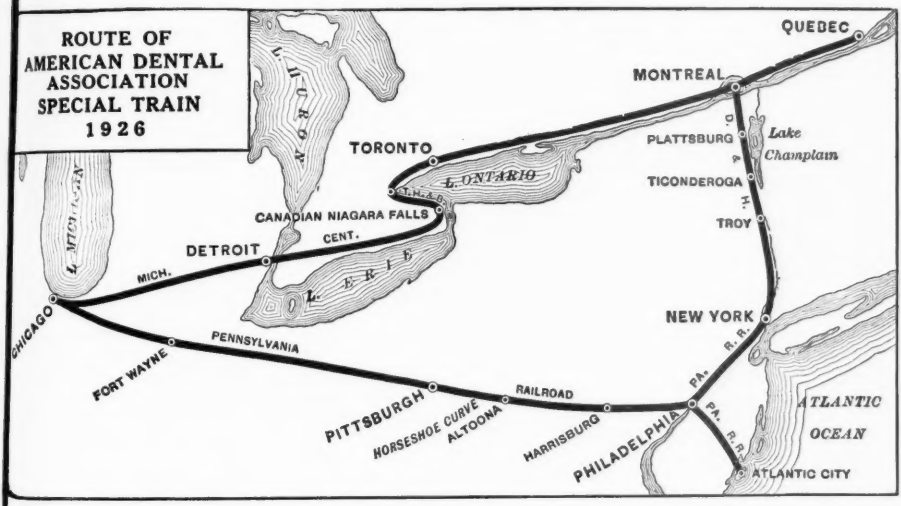
(Monday, August 23 to Friday, August 27—attending convention)

During the convention period, the entertainment committee in Philadelphia has provided for special sightseeing drives and a trip to Atlantic City.

Lv. Philadelphia (Penn. R. R.) ..... 7:00 p. m. Friday, August 27
Ar. New York ..... 9:00 p. m. Friday, August 27

The party will stop at the Waldorf Astoria in New York for two nights and two days, during which time special sightseeing drives will be made and a boat trip around Manhattan Island.

Members on tour No. 1 will leave New York at 11:00 p. m., Sunday, August 27, returning to Chicago, arriving at the latter point at 8:00 a. m, Monday, August 30, and Western delegates and friends may make train connections that evening for their homes. The cost of this trip as outlined above is $125 (basis one to a lower berth), which includes every accommodation, exclusive of meals.



TOUR NO. 2

Tour No. 2 is the same as Tour No. 1, up to and including New York and from that point is as follows:

Sunday August 29—Lv. New York by Hudson River steamer, 5:00 p. m.
Monday August 30—Ar. Albany 6:15 a. m.
Monday August 30—Lv. Albany 7:15 a. m. (D. & H. R. R.)
Monday August 30—Ar. Lake George
Monday August 30—Lv. Lake George via steamer
Monday August 30—Ar. Montcalm Landing 1:25 p. m.
Monday August 30—Ar. Plattsburg 6:40 p. m.
Monday August 30—Ar. Montreal 9:30 p. m.
(Stop over night at Windsor Hotel)

Tuesday August 31—A special steamer will take the party through the famous Lachine locks to the top of the rapids, where the steamer will turn and then shoot the rapids to Montreal. In the afternoon, a general sightseeing drive will be made around Montreal.

Tuesday August 31—Lv. Montreal 7:00 p. m. via SS. Canada for Quebec
Wednesday Sept. 1—Ar. Quebec 7:00 a. m.

Party will stop at the famous Chateau Frontenac at Quebec for one night and two days, during which time a side trip will be made to the world famous shrine of St. Anne de Beaupre and Montmorency Falls. During the visit at Quebec a general sightseeing trip will be made of the historical points of interest in and around this old city.

Friday Sept. 2—Lv. Quebec—SS. Canada, 7:00 p. m.
Saturday Sept. 3—Ar. Montreal 7:00 a. m.
Saturday Sept. 3—Lv. Montreal 9:15 a. m.
Saturday Sept. 3—Ar. Brockville 12:35 p. m.
Saturday Sept. 3—Lv. Brockville SS. Canada for cruise through the famous Thousand Islands
Sunday Sept. 4—Ar. Toronto 7:00 a. m., SS. Canada
Sunday Sept. 4—Lv. Toronto 8:15 a. m., SS. Canada
Sunday Sept. 4—Ar. Niagara Falls 1:00 p. m.

The afternoon and evening will be spent at Niagara Falls. This allows a splendid opportunity to view the night illumination of the Falls. Huge searchlights of 1,320,000,000 candle power play varicolored rays of light on the Falls transforming them into a fairyland of color.

Sunday Sept. 4—Lv. Niagara Falls (M. C. R. R.) 9:30 p. m. (ET)
Monday Sept. 5—Ar. Chicago 8:30 a. m. (CT)

COST

As previously advised, on application, the Powers Tours will forward folder outlining the trip more in detail and quoting rates from all points.

TOUR NO. 1

	1 To Lower Berth	1 To Upper Berth	2 To Lower Berth	Compt. 2 People	Drawing Room 2 People	Drawing Room 3 People
Chicago	$116.90	113.30	105.90	125.90	134.90	122.90
Milwaukee	121.50	117.90	112.50	130.50	139.50	127.50
Kansas City	139.95	136.40	130.95	148.95	158.00	145.95
Los Angeles	207.20	203.60	198.20	216.20	225.20	213.20

TOUR NO. 2

	1 To Lower Berth	1 To Upper Berth	2 To Lower Berth	Compt. 2 People	Drawing Room 2 People	Drawing Room 3 People
Chicago	$164.95	162.20	158.45	171.95	179.95	169.95
Milwaukee	170.50	164.00	167.75	177.50	185.50	175.50
Kansas City	194.75	188.25	192.00	201.75	209.75	199.73
Los Angeles	255.25	248.75	252.50	262.25	270.25	260.25

Prices from points west of Chicago include railroad ticket only between starting point and Chicago.

The Powers Tours will assume payment of hotel reservations to the amount of $4.00 per passenger, per day, for any member desiring to join the party and who may already have made their hotel reservations at Philadelphia.

All rates include necessary expense beyond Chicago for the round trip except meals. The items included are: transportation, sleeping car accommodations, hotel rooms, transfer of passengers and baggage, staterooms on night steamers and sightseeing specified. The party will be accompanied by one or more tour managers as its size requires.

For folders and additional information, address The Powers Tours, 105 N. Clark St., Chicago.

DELTA SIGMA DELTA BANQUET

Change of Date

The banquet of the Delta Sigma Delta Fraternity will be held, Friday, August 20, instead of August 26, as previously announced.

R. H. D. SWING,
Supreme Scribe.

RESOLUTIONS ON THE DEATH OF DR. BIDDLE

WHEREAS, Death has removed from our midst Dr. John Flocker Biddle and,

WHEREAS, Dr. Biddle was held in high esteem, both for his professional and for his personal charm; therefore, be it

Resolved, That organized dentistry has lost a most earnest and faithful and efficient advocate; that the American, state and local societies have suffered an irreparable loss; and that the Central Pennsylvania Dental Society has lost a loved and valued friend, and be it further

Resolved, That a copy of these resolutions be spread upon the minutes, a copy sent to the American, Pennsylvania State, and Odontological Societies, and to the bereaved family with our sincere sympathy.

CENTRAL PENNSYLVANIA DENTAL SOCIETY.
J. L. PORIAS, *Recording Secretary.*

BOOK REVIEWS

Clinical Preventive Dentistry. Based on a New Type of X-Ray Examination. By Howard Riley Raper, D.D.S., F.A.C.D., formerly Professor of Radiodontia, Materia Medica and Operative Technic, and Junior Dean, Indiana Dental College; author of "Elementary and Dental Radiography," "Electro-Radiographic Diagnosis," and "Radiodontia." Rochester, N. Y.: Ritter Dental Manufacturing Company, Inc., Illustrated; pp. 124.

When Dr. Raper writes on any subject, he says something worth while, and his present contention is that small proximal cavities may be detected by the roentgen-ray before they can be discovered by an instrument or a mirror. In line with this theory, he says, at the beginning "The prevention of caries is something to strive for; the prevention of toothache is something to *do*." And in elucidating this idea, he publishes many pictures and covers 124 pages of text. It is useless to try to analyze his arguments in a brief review, but the reader is invited to study this book from beginning to end, and he will come out of that study a better dentist. There is not a dull page in it—Dr. Raper never wrote a dull page—and the book will well repay a careful reading.

The Technic of Oral Radiography. By Clarence O. Simpson, M.D., D.D.S., F.A.C.D., St. Louis, Mo.: The C. V. Mosby Company. 175 illustrations; pp. 207. Price, $5.00.

The rapid accumulation of literature on radiography is indicative of the increasing interest in the subject. This book is precisely what it purports to be—a careful exposition of the technical procedures necessary to obtain good roentgen-ray pictures. Dr. Simpson has been so prominently identified with the development of this science that he is qualified to speak with authority on the subject. His descriptions are clear and easily understood, and the splendid illustrations supplement the text on nearly every page. It is a book carefully prepared; the ideas are sanely presented, and the volume is well printed. It should be in the library of every one interested in the subject, where it will be readily available for reference and study.

SERVANTS TO THE BUYER

By Ernest V. Madison

The assistance given by advertisements to the buyer (the readers of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION included, if you please) is multiple and varied.

An advertisement cooperates with the intelligence. It awakens thought, and stimulates good judgment. It does not use force but reasons, persuades, criticizes.

It facilitates mental detail for the buyer by summarizing the facts which he requires for decision.

It is an assurance of the moral purpose and business sagacity of the advertiser. The printed truth can only be a *scourge* to the fakers in business.

It serves buyers located in out-of-the-way places where salesmen cannot afford to go.

It creates a larger demand, necessitates manufacture in larger quantities, keeps factories operating without losses due to slackening of orders, lowers the *per unit* cost of manufacture, and thus reduces the selling price.

These are established facts about the use of advertisements. They are servants to the buyer.

Careful purchasers in the dental field have long realized the importance (and are regular readers) of the advertisements published in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.